# THE FOSSIL COLLECTOR

BULLETIN Nº 34 MAY 1991

New genus of cheirurid trilobite from Victoria
(details, page 45)

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# FOSSIL COLLECTORS' ASSOCIATION OF AUSTRALASIA

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# EDITORIAL

Once again we have well and truly exceeded our target of 36 pages per issue, thanks to Ken Bell, David Holloway, Robert Knezour and Ralph Molnar who kindly provided articles for this issue and a last minute report from Sue Turner on the 3rd International Conference on Australasian Vertebrate Evolution, Palaeontology and Systematics in Alice Springs. The recent publication of three new books of particular interest to members (see BOOKS & BOOK REVIEWS) has also helped swell the size of this bulletin.

Due to the late arrival of a number of subscriptions and the time required to compile a new address list (for the first time on a word processor), we have decided to postpone the publication of the 1991/92 membership list until the September Bulletin.

Finally, the Association's thanks to members who have made donations over the last year. This will help towards any future FCAA contributions to palaeontological research projects.

Material for the next issue should be submitted to the Editor by 15th August, 1991.

Frank Holmes

# FINANCES

Income and expenditure for the Financial Year, 1st March, 1990 to 28th February, 1991 (previous year's income and expenditure shown in brackets).

INCOME

| | | |
|---|---|---|
| Subscriptions | | |
| current | 967.50 | (1,068.54) |
| advance | 981.28 | ( 748.70) |
| Donations | 32.30 | ( 3.00) |
| Advertising | 8.00 | - |
| Bank interest | 141.20 | ( 144.61) |
| Sale of Bulletins | 141.90 | ( 88.25) |
| Miscellaneous | 2.50 | ( 6.72) |
| | $2,274.68 | (2,059.82) |

EXPENDITURE

| | | |
|---|---|---|
| Postage | 562.51 | ( 683.50) |
| Printing | 517.98 | ( 491.25) |
| Photocopies, photo's & bromides | 147.10 | ( 214.10) |
| Stationery | 76.44 | ( 3.16) |
| Sundries | 96.97 | ( 98.85) |
| State Rep. expenses | 28.22 | ( 63.35) |
| Subscriptions | 30.00 | - |
| State/Fed. tax | 5.85 | ( 5.38) |
| Miscellaneous | 2.55 | - |
| WP purchase (50%) | 555.00 | - |
| | $2,022.62 | (1,809.59) |

Balance at 28th February, 1991

| | | |
|---|---|---|
| Brought forward from | 1989/1990 | $1,905.67 |
| Add income | 1990/1991 | $2,274.68 |
| | | $4,180.35 |
| Less expenditure | 1990/1991 | $2,022.62 |
| | | $2,157.73 |

When the above figures are adjusted to include 1990/91 subscriptions paid in 1988/89 and 1989/90 ($732.42) and to exclude 1991/92 and 1992/93 subscriptions paid in advance ($981.28), income for the Financial Year 1990/91 exceeded expenditure by $3.20 compared with $121.90 for the previous Financial Year.

After deducting total advance subscriptions of $1,024.28 from the balance in hand at 28th February, 1991, we are left with a nett reserve of $1,133.45 ($1,130.25).

Assets valued at approximately $1,020.00 include part ownership of a Word Processor (50%), stationery, staplers and back issues of Bulletins etc. At 28th February, 1991, there were no liabilities.

# C. A. V. E. P. S. 1991

About 40 vertebrate palaeontologists and fellow travellers met in Alice Springs this past Easter for the 3rd International Conference on Australasian Vertebrate Evolution, Palaeontology and Systematics. The meeting was pleasantly informal as befits the pace and lifestyle of the Territory. Peter Murray, with co-organisers Leanne Dansie and Carl & Bobbie Roth and other staff of the Northern Territory Museum, (Alice Springs Branch) pulled out all the stops to make the Symposium a memorable one. Despite the problems of the time and place of the venue, palaeontologists came from all over Australia, and from overseas - USA and UK.

The first day was devoted to the latest in the fascinating Australian "megafauna" and its precursors in the Tertiary. An analysis of climate and vegetation through the Tertiary by Robert Hill (University of Tasmania) set the scene for talks from the University of NSW VP School on marsupials, snakes and bats from the now world-famous Riversleigh deposits. Henk Godthelp gave a summary of the exciting new Tertiary site at Boat Mountain, Queensland. Dates and validity for the Pleistocene megafauna were systematically analysed and mostly rejected by Alex Baines (WAM)

## C. A. V. E. P. S. 1991 (Cont'd)

in the light of a new set of dating criteria. Peter Murray gave us new ideas and reconstructions on dwarf zygomaturines and wombats with thickheads.

This was followed by sessions going back in time to the older faunas of Australia and more general themes :- Tony Thulborn demolished Bakker's hot-blooded dinosaur arguments and Sue Turner talked about Cretaceous shark vertebrates from the Northern Territory and Queensland (were there even greater sharks in the Cretaceous seas than modern great whites and whale sharks?); Triassic to Cretaceous amphibians Anne Warren and Tom Rich described the tenaciousness of the giant labyrinthodonts in Australia. The fossil history of the smaller vertebrates was outlined by Mark Hutchinson who gave us the scanty record of Australian skinks. John Long brought us up to date on new finds in WA - Devonian lungfish in the unique Gogo fauna where 3-D remains can be put together like a jigsaw puzzle, to new and exciting finds of dinosaurs from the Jurassic and Cretaceous. Gavin Young introduced his new class of vertebrates, based on weird little agnathan fish remains found preserved in Devonian sandstone of the Georgina Basin of Queensland, and then treated us to tantalising evidence of some of the oldest fish remains on earth, 485 million year old Ordovician fragments from central Australia - Alice being a fitting place to discuss these new finds. Alex Ritchie complimented this talk by presenting his ideas on other Ordovician fish remains from central Australia, presenting new material and recounting the history and relationships of these first vertebrates. The significance of these two talks about the wealth and antiquity of Australian vertebrate fossils to our understanding of life on earth underlines the need to maintain these studies, which enrich the cultural as well as scientific base in Australia and worldwide. Andrew Constantine (Monash) gave a polished talk on the sedimentological background for the Early Cretaceous Strzlecki and Otway Groups; Paul Willis (NSW) treated us to an analysis of Tertiary crocodilians in Australia. They shared the de Vis and AAP Prize for Best Student paper.

Peter Murray and his team had prepared several displays, arranged them along with those brought by participants alongside his fine reconstruction in the gallery of the Spencer & Gillen Museum. This branch of the NT museum requires immediate support from one and all of us if it is not to be disbanded in the near future. During the meeting a press release from a NT Government Minister, Michael Reed, put a damper on the proceedings because of the announcement of the threatened imminent closure of the Museum. It is quite clear, however, that Murray and his fellow workers put great professionalism and enthusiasm into this key exposition of Australian prehistory. Central Australia is one of the most significant areas for all Australians, whether your interest be fossil vertebrates, natural history, or aboriginal cultural heritage. The meeting concluded with a resolution from all participants that a formal protest be made to the NT Government and full support be given to the Spencer & Gillen Museum.

Post-conference field trips were off in convoy on Easter Sunday with a trip to Alcoota Scientific Reserve to view the excellent Tertiary marsupial and remains of giant birds and crocodilian which are preserved as scattered bones in a field of grey siltstone. Excavation of the day brought to light a fine Kolopsis skull. The intrepid few set off for a journey and overnight camp into the western McDonnell Ranges to look at the important Devonian fish locality at Stokes Pass, stopping en route to view the Ochre Pits. Alex Ritchie was happily reunited with a giant slab of fish plates he'd had to leave on a previous occasion. He went on to discover the first crossopterygian preserved in the round in the Harajica Sandstone. Other new lungfish and placoderms were turned up by the party.

Farewells were made at Stokes Pass. Some returned to Alice, others went on to do more field work...................but that's another story.

Susan Turner, April 1991.

# MINMI PARAVERTEBRA

Ralph Molnar, Queensland Museum, South Brisbane, Qld.

Bones appeared in the bank of a gully near the homestead of "Marathon" one day in October, 1989. In this gully,draining into the Flinders River, east of Richmond, Queensland, Mr. Ian Ievers found a long toothy snout, like that of a freshwater crocodile. He rang the Queensland Museum to report the fossil and determine its significance. He astutely noted that much of the skull seemed to be present, and more importantly, the vertebrae of the neck were in place and appeared to extend into the bank. This suggested that just a few feet under the surface of the paddock was a complete skeleton.

At the Museum, Dr. Mary Wade has been studying ichthyosaurs for the past few years, Mr. Ievers's specimen promised to be complete and Dr. Wade was seeking an ichthyosaur skeleton with the hind paddles fully preserved - so she arranged to go north and collect what she hoped to be a complete ichthyosaur. This was a rational hope, after all ichthyosaurs were the most common marine reptiles in these rocks, next to turtles - and turtles never did have long toothy snouts. However, it was not to be. What Dr. Wade and her team uncovered was a nearly complete skeleton of a pliosaur, another marine reptile only rather distantly related to ichthyosaurs, and much rarer.

So when, some weeks later, Mr. Ievers rang again and reported that he had found a second skeleton, we thought that Mary's ichthyosaur had finally turned up. Mr. Ievers volunteered to send to the Museum a piece for identification. This arrived a few weeks later, and to our surprise and delight proved that we had been wrong again - this time an even rarer beast had been found, a dinosaur. As it turned out, the most complete dinosaurian skeleton yet found in Australia.

Because of the rainy season we were not able to collect it immediately, and so we went shortly after the new year, and collected the specimen in the midst of the 40 degree summer heat. Luckily it took only three days and the Ievers's offered the hospitality of a spare room at the homestead.

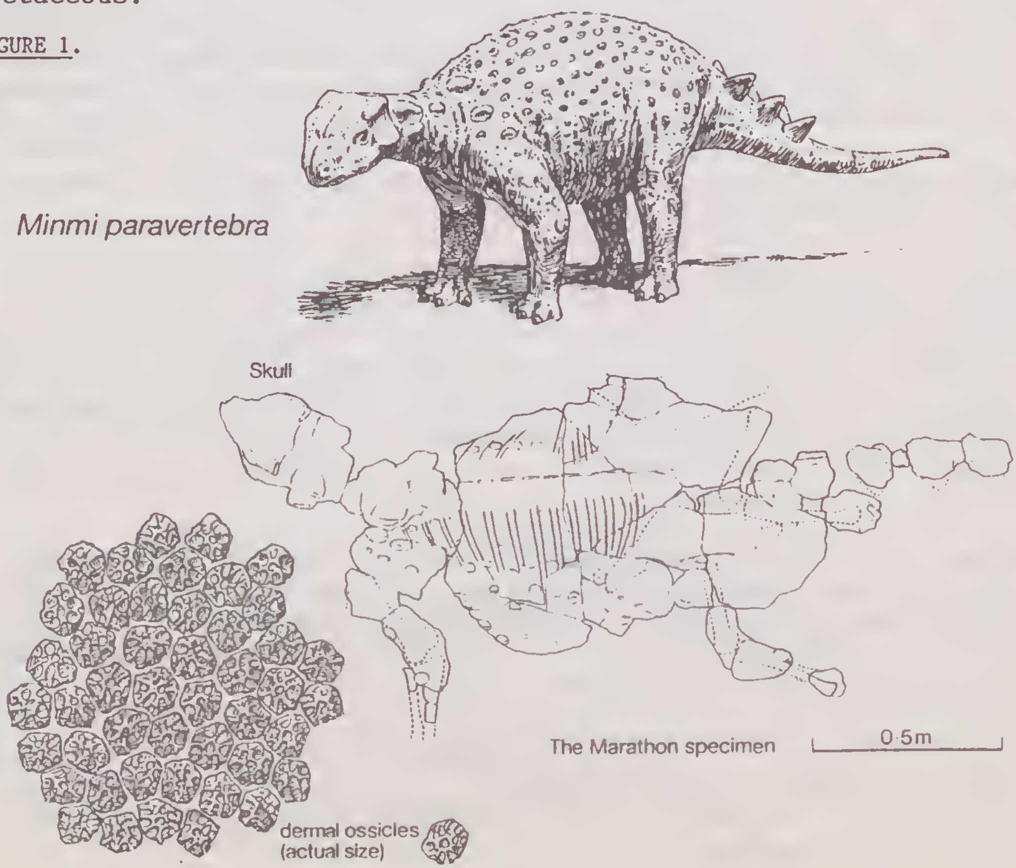
The skeleton was that of an ankylosaurian dinosaur, a group of armoured dinosaurs found throughout the northern hemisphere but most plentiful in Mongolia and the western United States and Canada. The best specimens are from the Late Cretaceous period, 97-

MINMI PARAVERTEBRA (Cont.)

65 million years ago - although ankylosaurs appeared in the Jurassic period, some 150 million years ago. This specimen is probably the best preserved ankylosaur from the Early Cretaceous, better than any Jurassic specimen, and better than most Late Cretaceous ones as well. It is the best not only from Australia, but from the entire southern hemisphere.

Ankylosaurs are not well-known dinosaurs: too often only isolated pieces of the dermal armour are found. There are few mounted specimens, seven at most. Ankylosaurs appeared during the Jurassic in western Europe and China, and spread throughout the northern hemisphere during Early Cretaceous times. Most early ankylosaurs belonged to the Nodosauridae, which survived until the end of the Cretaceous. A second family, the Ankylosauridae, appeared in the Early Cretaceous and spread across the northern hemisphere to become the largest, and most prominent ankylosaurs of the Late Cretaceous.

FIGURE 1.



Ankylosaurs had long been reported in the southern hemisphere, but careful examination of the specimens and published descriptions shows that only two of these reports are valid. The others represent other armoured dinosaurs, or crocodilians, or other creatures altogether. Together with the "Marathon" specimen, these make only three specimens from the entire southern hemisphere. One of these is the first dinosaur discovered in Antarctica, while the third is the original specimen of Minmi from southeastern Queensland, near Roma.

The original specimen, the first armoured dinosaur from Australia, was discovered in the early 60's. Found in marine rocks near Roma, southeastern Queensland, it was initially thought to be the remains of some kind of marine reptile. I studied the specimen in the mid 70's, developing the bones slowly out of the calcareous concretions by dissolving them in dilute acetic acid. As the bones appeared, it became clear that it was no marine reptile, but some kind of armoured dinosaur. But it was no ordinary dinosaur. Firstly it had armour over its belly - most amoured dinosaurs had armour on their backs, not their bellies. Secondly, there were clay inclusions in the rock just below the ribs - as if the digestive tract had become filled with mud after the beast had died. Unfortunately, no convincing evidence was found that this was the origin of the inclusions. Thirdly,a series of odd flat bones were found alongside the vertebral column: apparently when alive these were embedded in the back muscles. Many dinosaurs have tendons in this position, that become ossified but these bones did not resemble such tendons, as could be seen by comparing them with the normal ossified tendons present as well. There were two possibilities: either these odd bones were really ossified tendons of an unusual form, or they were perhaps related to the armour that this dinosaur sported on its back.

It was some four years later, under rather unusual circumstances (not recommended) that I learned just what these odd bones were. In 1984, while travelling to a conference in southern Germany, I had an accident that required surgery and returning home to convalesce. The proceedings were published within three months of the conference, very likely a world record. While waiting to see my physician I glanced through the publication. A paper by a German student, Eberhart Frey, caught my attention. He had studied the back muscles of alligators, and their tendons. These tendons were in form very much like the odd bones of Minmi, and suggested that these bones were ossified tendons after all. I promptly wrote to Herr (now Dr.) Frey and we collaborated on a

MINMI PARAVERTEBRA (Cont.)

second paper regarding these structures.

We suggested that there were certain similarities between crocodilians and ankylosaurs in the way they walked. Crocs usually sprawl, but when in a hurry, they bring the legs beneath the body, like mammals, in what is called the 'high walk'. The similarities chiefly related to how the weight of the trunk was supported, to keep the belly from dragging on the ground, in most dinosaurs the muscles supporting the weight of the trunk attached to elongate vertebral spines at the sacrum. Ankylosaurs did not have such elongate spines, and neither do crocodilians. Herr Frey had discovered that in crocodilians these weight-supporting muscles attached to the armour plates of the back via a set of tendons that looked remarkably like those odd little bones of Minmi. As a result we suggested that in Minmi, as in crocs, the trunk was supported by these muscles and tendons. Only in Minmi the tendons had become ossified.

The first specimen of Minmi had no evidence for back armour, so we suggested that maybe the tendons had taken the place of that armour in its role of providing support for the back (the tendons of Minmi attached directly to the vertebrae). Perhaps they were so well-developed because Minmi relied less on armour to escape predators than on running away. If so,two predictions could be made. First, more complete specimens of Minmi would have no dorsal armour. And, second the limb elements would be more slender than those of other ankylosaurs.

In 1985, we were confident that with only one ankylosaur ever having been found in Australia, it was unlikely that a more complete specimen would be found in the near future. We were dead wrong. We were also dead wrong about the dorsal armour: it was there...however, we seem to have been right about the limb elements. Those of the forelimb at least are significantly more slender than other ankylosaurs, whether nodosaurids or ankylosaurids.

The new specimen was an articulated skeleton, including the head, most of the neck, the trunk, much of the forelimbs, and almost all of at least one hind limb, and perhaps a third of the tail. Every time we examine the specimen, more of the skeleton is recognised. In addition, the armour of the back is preserved in situ, as it was in life - or rather, just after death. This is known in only three other specimens, all from western North America.

The blocks of carbonate in which the skeleton is preserved, show unusual curved layers that may be remnants of the actual skin.

The unusually complete preservation of the carcass reveals that the back was apparently completely covered with small ossicles. These small ossicles of the original specimen had formed a belly armour, so apparently the trunk of the beast was completely encased in a kind of bony chainmail. Some of these ossicles formed a layer not only above, but also beneath some bones, the ilium for instance, as if the belly armour had collapsed against these bones - the skeleton was upside down when found.

This specimen has a broad, flat skull, with an arched snout - not a characteristic of nodosaurids, but of ankylosaurids. But it also has a rather narrow skull, which is a feature of nodosaurids not ankylosaurids. Because this is an early ankylosaur it might be expected to show some features more like those of the ankylosaurian ancestors than of the later (more derived) anky-

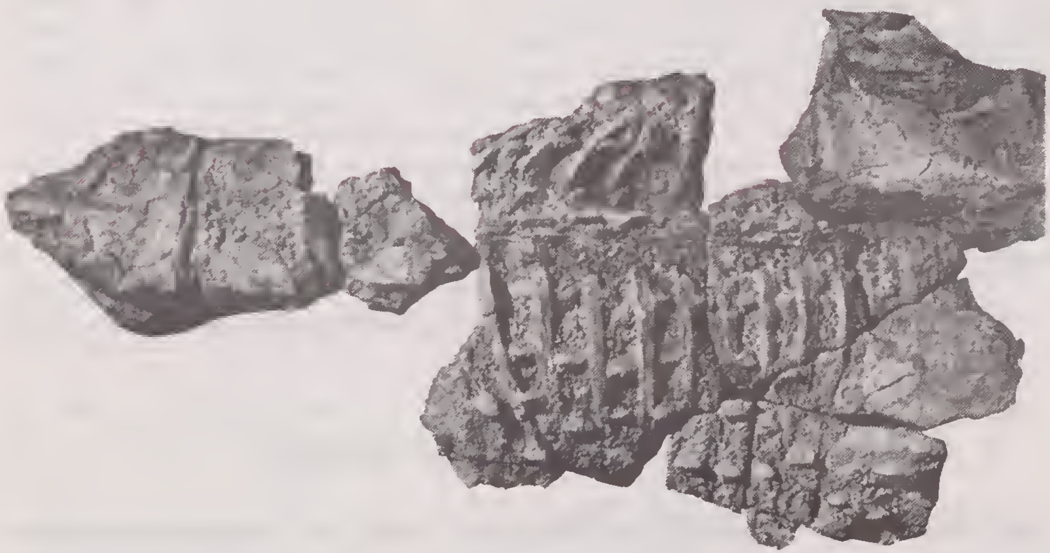


FIGURE 2. The specimen of the ankylosaur Minmi paravertebra from 'Marathon', near Richmond, Queensland. The skull may be seen to the left, and the pelvis at the right margin. Scutes and ossicles making up the dermal armour, and the ribs are visible in the intervening blocks. Along the line of the neural spines, the slightly diagonally orientated paravertebral structures can be seen. This photograph was made before the shoulder blocks were recognised, and hence the neck-shoulder region is too short and incorrectly arranged. Photograph courtesy of the Queensland Museum.

MINMI PARAVERTEBRA (Cont.)

losaurs. Among such features are that the scapula is narrower than in other ankylosaurs, and formed more like that of an ornithopod (as far as we can tell). The ilium extends as far behind the acetabulum as it does in front, unlike other ankylosaurs where the anterior part of the ilium is two to three times as long as the posterior.

How the 'new' specimen was preserved is an interesting exercise in deduction. There were several oddities about the skeleton, for example most of the bones were in place as was the armour, but the axis had been displaced over a foot from where it should have been. If the skull, the armour of the skin of the neck, and the remaining vertebrae of the neck were all in place, how did this one bone come to be displaced? Furthermore the small ossicles of the 'chain-mail' had come to lay between the ribs. A dried, hollow dragon carcass once given me by Mike Archer suggested an explanation. As the skin dried, it seemingly also shrank inwards, sagging between the ribs. Many of the bones near or in contact with the skin were held in place by the dried skin, but others were loose inside. The animal had died and been thoroughly dried. Perhaps this happened during the dry season or during a drought. Later this dried 'mummy' was washed out to sea (in a flood? or during the wet season?), and drifted some distance from the shore. Eventually it sank, and in so doing turned over and the axis fell out to sink to the seabed nearby. It was preserved in the limy muds, and eventually exposed some 100 million years later to be found by Ian Ievers.

# AUSTRALIAN TERTIARY CASSIDULOIDS - AN OVERVIEW (PART 1)

Frank Holmes, Heathmont, Victoria.

ABSTRACT
Fifteen species of Cassiduloids (Echinoidea) have to date been described from Tertiary marine sediments in southern Australia. Part 1 of this article illustrates and gives a brief outline of the history, geologic range, distribution, external morphology and size of the five non Echinolampadids, Australanthus longianus (Gregory, 1890), Eurhodia australiae (Duncan, 1877), Apatopygus vincentinus (Tate, 1891), Cassidulus florescens Gregory, 1892, and Studeria elegans (Laube, 1869). Generally, comparative photographs and drawings of these species have not been published before. In most cases the only previously known illustrations are those included with the original nineteenth century description of the species.

Part 2, to be published in September, will include comparative illustrations of Australian Tertiary Echinolampadids and notes on the similarity between some fossil Cassiduloids and Neolampadoids.

## INTRODUCTION

Australian Late Cretaceous and Tertiary fossil echinoids, currently described, number approximately 150 species, a mere ten per cent of which are classified as belonging to the Order Cassiduloida. Of the fifteen Cassiduloids, ten are species or subspecies of one genus, Echinolampas, while the others represent five different genera from four families.

Fossil Cassiduloids found in Australia date from the Late Eocene to the Middle Miocene and although all species referred to in this article are, with the possible exception of Echinolampas posterocrassa [refer Brighton, 1930], unique to this continent, only Australanthus among the genera represented is similarly restricted.

In 1980, McNamara and Philip published a review of the then known Tertiary species of Echinolampas from southern Australia in which they included three new forms. McNamara (1987 & 1989) raised a further new species of Echinolampas based on a late nineteenth century specimen from Bairnsdale, Victoria, which although previously believed to have been lost, was relocated during a subsequent examination of the echinoid collections of the British Museum (Natural History).

Unfortunately there has been no such revision of the other species of Australian Cassiduloids. In fact two species, Eurhodia australiae (Duncan, 1877) and Apatopygus vincentinus (Tate, 1891) seem to have been ignored in major works on the Order, such as

AUSTRALIAN TERTIARY CASSIDULOIDS - AN OVERVIEW (Cont'd)

Lambert & Thiery (1921), Mortensen (1948) and Kier (1962 & 1966). In this century only H. L. Clark (1946) mentions the two species, other than as elements of a particular fauna, and in so doing referred them to the genus Nucleolites, a genus now considered to range only from the Middle Jurassic (Bajocian) to the Upper Cretaceous (Cenomanian).

## GENERAL MORPHOLOGY

Cassiduloids reached their zenith in the Eocene, having first appeared in the fossil record during the Early Jurassic. This Order of irregular echinoids is distinguished primarily by the presence of phyllodes and bourrelets adjacent to the peristome (mouth), as illustrated in Fig. 1C, and by five petals adapically. There are no fascioles, food grooves or plastron and the aristotle's lantern is absent in adults.

As pre-Eocene Cassiduloids have not been recorded in Australia, in addition to the above features, species discussed in this article have a monobasal apical system as opposed to the tetrabasal apical system found in virtually all pre-Paleocene species (Fig. 1A & B);

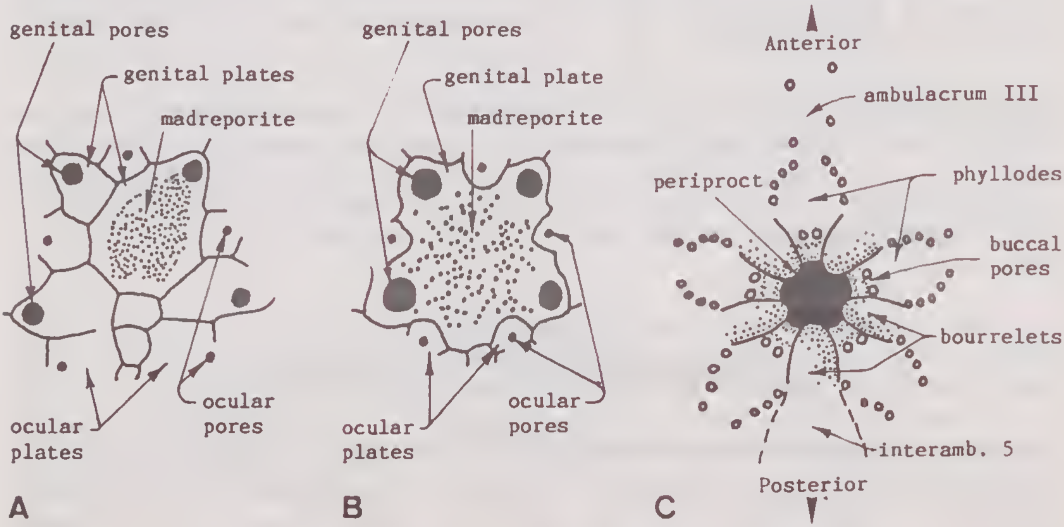



FIGURE 1. A, diagram of a tetrabasal apical system (four genital plates) based on the Jurassic cassiduloid, Nucleolites brodieri (Wright), x 15; B, diagram of a monobasal apical system (single genital plate) based on the Paleocene cassiduloid, Plesiolampas cf. ovalis Duncan & Sladen, x 15; C, floscelle (the star shaped area around the mouth), phyllodes and bourrelets of the Late Eocene cassiduloid, Australanthus longianus (Gregory), x 2. Diagrams A & B after Kier (1962).

single, not double, ambulacral pores beyond the petals; and, with the exception of Apatopygus, buccal pores. It should also be noted that the genus Apatopygus has a tetrabasal apical system in the juvenile stage but not in the adult (Kier, 1962).

## CLASSIFICATION

The sequence used below is based on the accepted age of the first occurrence of the genus within Australia, or in the case of Echinolampas, the genus and species. Information on the age, horizon and distribution are listed in the section giving morphological details and illustrations of individual species.

Order Cassiduloida Claus, 1880

Family Faujasiidae Lambert, 1905
Genus Australanthus Bittner, 1892
Australanthus longianus (Gregory, 1890)

Family Pliolampadidae Kier, 1962
Genus Eurhodia Haime, 1853
Eurhodia australiae (Duncan, 1877)

Family Apatopygidae Kier, 1962
Genus Apatopygus Hawkins, 1920
Apatopygus vincentinus (Tate, 1891)

Family Echinolampadidae Gray, 1851
Genus Echinolampas Gray, 1825
Echinolampas posterocrassa posterocrassa Gregory, 1890
E. posterocrassa curtata McNamara & Philip, 1980
E. tatei Lambert, 1898
E. aff. tatei Lambert; McNamara & Philip, 1980
E. gambierensis Tenison Woods, 1867
E. morgani Cotteau, 1889
E. ovulum Laube, 1869
E. gregoryi corrugata McNamara & Philip, 1980
E. gregoryi gregoryi McNamara & Philip, 1980
E. laubei nom. nov. McNamara, 1989

Family Cassidulidae L. Agassiz & Desor, 1847
Genus Cassidulus Lamark, 1801
Cassidulus florescens Gregory, 1892

Family Pliolampadidae Kier, 1962
Genus Studeria Duncan, 1889
Studeria elegans (Laube, 1869)

AUSTRALIAN TERTIARY CASSIDULOIDS - AN OVERVIEW (Cont'd)

## DETAILS AND DISTRIBUTION OF SPECIES

In the following section details of each species are listed under the following headings: HISTORY - including notes on synonymy; RANGE - known geologic time during which species lived; LOCALITIES - including formation and age; DESCRIPTION - prominent features to assist identification, based on specimens available to the author; and SIZE - dimensions of illustrated and type specimens (in millimetres). Note: specimens of Late Eocene species recorded in early collections as originating from Aldinga or Willunga, near Adelaide, South Australia, are deemed to be from the Tortachilla Limestone or possibly the overlying Blanche Point Transitional Marls, the source of recently collected material.

**Australanthus longianus** (Gregory, 1890)
Gregory, 1890: 482, pl. 13/1-3
[Figs. 1C, 2F, 3A & B]

HISTORY: Two years after Gregory described and illustrated this species as a member of the genus *Cassidulus*, Bittner (1892) erected a new genus *Australanthus* with *C. longianus* as the type species. Although Gregory (1892) considered *Australanthus* should be used only as a subgenus of *Cassidulus* and Lambert & Thiery (1921) referred to it as a subgenus of *Procassidulus*, Bittner's genus is now accepted on its own.

RANGE: Late Eocene (Aldingan), South & Western Australia.

LOCALITIES: Tortachilla Limestone, Maslin Bay cliffs, South Australia [St Vincent Basin].

Kingscote Limestone (lower bed), Kingscote, Kangaroo Island, South Australia [St Vincent Basin].

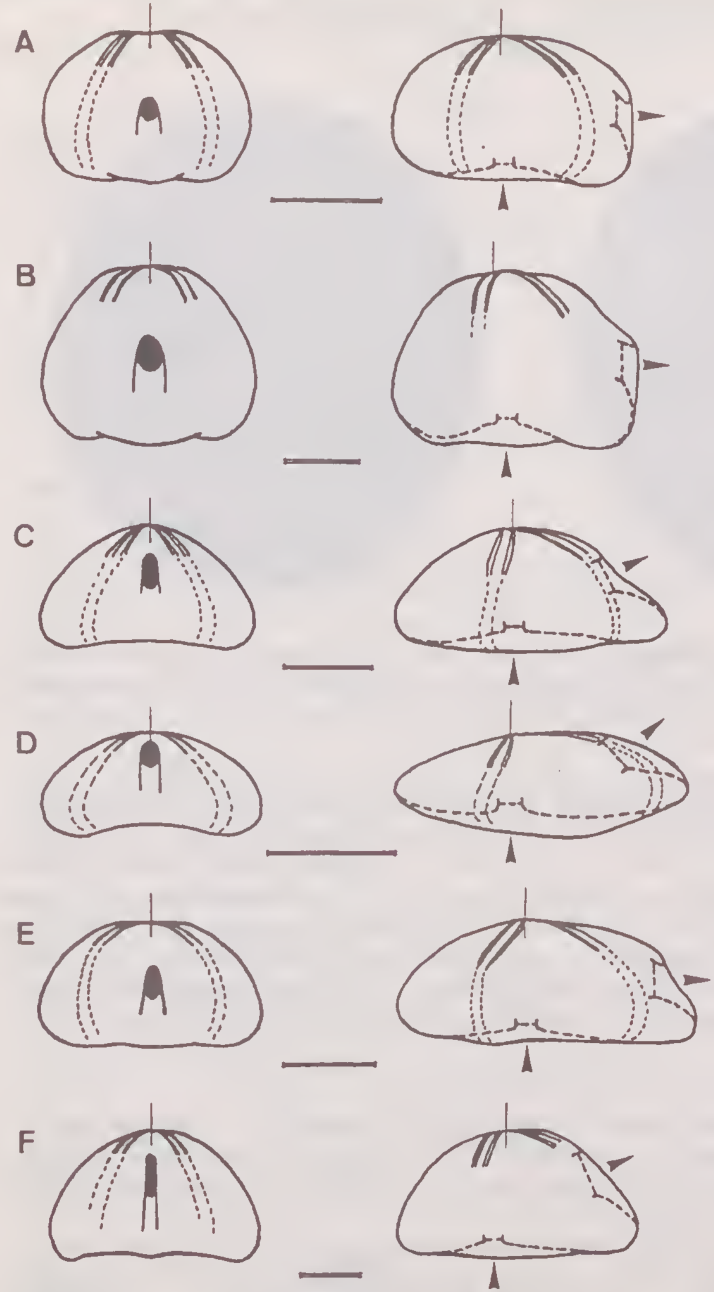
Buccleugh Group (Bed A of Ludbrook, 1961), in a bore in the Moorlands area, South Australia [Murray Basin].

Toolinna Limestone, Toolinna Cave, Nullarbor Plain, Western Australia [Eucla Basin].

Wilson Bluff Limestone, Wilson Bluff, Haig Cave, Cocklebiddy Cave, Weebubbie Cave & Old Homestead Cave, Nullarbor Plain, Western Australia [Eucla Basin].

Nanarup Limestone Member of the Werillup Formation, Nanarup, Western Australia [Bremer Basin].

DESCRIPTION: Test medium to large, oval, moderately inflated with greatest width posterior to the centre; apex varied




A. Studeria elegans (Laube, 1869). Early Miocene, ? Mannum Formation. Klose Road, nr. Mannum, S. Aust.

B. Studeria cf. elegans Early Miocene, ? Mannum Formation. Cowirra Swamp Road, nr. Mannum, South Australia.

C. Cassidulus florescens Gregory, 1892. Late Oligocene (Janjukian), Point Addis Lst. Point Addis, Victoria.

D. Apatopygus vincentinus (Tate, 1891). Late Eocene, Tortachilla Limestone. Maslin Bay, South Australia.

E. Eurhodia australiae (Duncan, 1877). Late Eocene, Tortachilla Limestone. Maslin Bay, South Australia.

F. Australanthus longianus (Gregory, 1890). Lower beds, Aldinga [? = Late Eocene, Tortachilla Limestone], South Aust. Specimen MV P19229.

FIGURE 2. Comparison of posterior (left) and lateral (right) profiles of the five non Echinolampadid Australian Tertiary Cassiduloids. An exceptionally large and unusually inflated specimen, Studeria cf. elegans (B), is also included for comparison. The posterior recess for the periproct (anus) and the adoral depression for the peristome (mouth) are shown with a broken line. Scale bars equal 1 cm.

AUSTRALIAN TERTIARY CASSIDULOIDS - AN OVERVIEW (Cont'd)

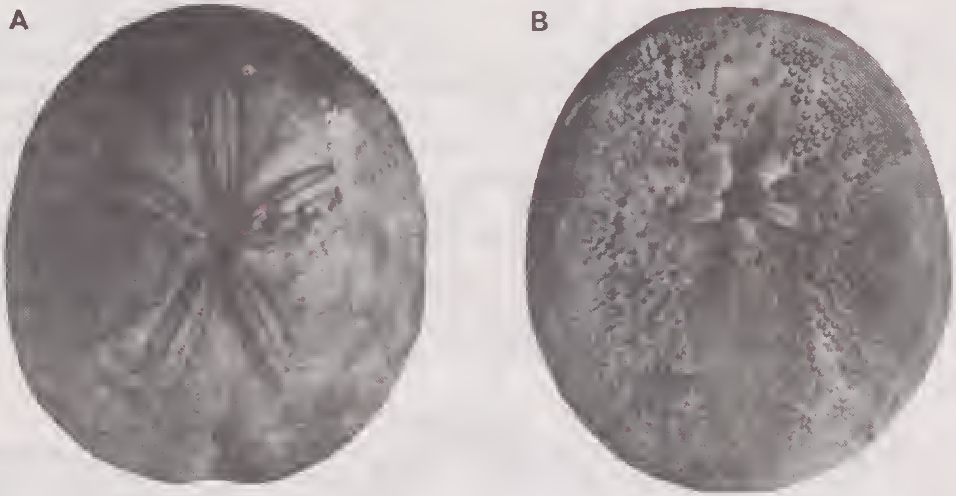



FIGURE 3. Australanthus longianus (Gregory, 1890). A, adapical view of specimen MV P19225, x 1.1; B, adoral view of specimen MV P19229, x 1.4. Both specimens from "Aldinga" [Tortachilla Limestone ?], South Australia.

posteriorly from centre; apical system anterior with four genital pores; petals open, flush with test, extending half way to margin, anterior petal (ambulacrum III) slightly longer than others; pore pairs strongly conjugate; periproct (anus) supramarginal in long narrow groove reaching almost to posterior margin; peristome (mouth) anterior, pentagonal in shape and surrounded by very prominent sharply inflated bourrelets and depressed phyllodes (fig. 1C); adoral (bottom) surface moderately depressed around peristome.

SIZE: Illustrated specimen (adapical surface) - length 58.3, width 49.6, height 30.0 [MV P19225, "Aldinga", S.A.]; illust. spec. (adoral surface) - length 46.8, width 40.6, height 25.0 [MV P19229, "Aldinga", S.A.].

Syntypes (Gregory, 1890) - A, length 65.0, width 56.0, height 30.0; B, length 45.0, width 42.0, height 22.0; C, length 43.0, width 40.0, height 20.0 [all from "Willunga" S.A.].

Largest specimen recorded by the author - length 79.0, width 69.0, height 36.0 [Kingscote, S.A.].

**Eurhodia australiae** (Duncan, 1877)
Duncan, 1877: 50, pl.3/11
[Figs. 2E & 4A & B]

HISTORY: Duncan originally placed this species in the genus Echinobrissus Breynius, where it remained until 1946 when H. L. Clark reassigned it to Nucleolites. Since it is a Tertiary form with single pores beyond the petals and a monobasal apical system it clearly does not belong in this latter genus. Philip (1970), in a schedule of echinoids from the Late Eocene Tortachilla Limestone, reassigned it to the genus Eurhodia Haime, but without any comment or redescription. This reassignment is here accepted as, based on Kier (1962), the species would appear to fall well within the generic concept of Eurhodia.

RANGE: There is no doubt that this is a late Eocene species based on specimens collected in South Australia. However, the holotype described by Duncan was found at Castle Cove, near Cape Otway, Victoria (Wilkinson's No. 5 locality), where the exposed Tertiary sequence ranges from the late Middle Eocene, Johanna River Sand, to the Early Miocene, Fishing Point Marl. The probable source of the specimen is the Castle Cove Limestone which spans the Eocene/Oligocene boundary (Abele et al., 1988). Unfortunately there is no record of specimens being found there this century. Until someone can verify the exact horizon in which it occurs, the possibility that this species extends into the Early Oligocene cannot be ruled out.

LOCALITIES: Castle Cove Limestone ?, Castle Cove, nr. Cape Otway, Victoria [Otway Basin].

Tortachilla Limestone (Late Eocene), Maslin Bay cliffs, South Australia [St Vincent Basin].

Kingscote Limestone (Late Eocene, lower bed ?), Kingscote, Kangaroo Island, South Australia [St Vincent Basin].

Nanarup Limestone Member of the Werillup Formation (Late Eocene), Nanarup, Western Australia [Bremer Basin].

Note: Hall & Pritchard (1895) list E. australiae as occurring at Waurn Ponds, Victoria. As the Waurn Ponds Limestone is of Late Oligocene age and contains Cassidulus florescens, this reference must be considered suspect, particularly as no Victorian specimens of E. australiae exist in the Museum of Victoria collection, the holotype being in the British Museum (Natural History). The South Australian Museum has two specimens labelled as originating from the Murray River cliffs. On current evidence this locality information must also be considered suspect.

AUSTRALIAN TERTIARY CASSIDULOIDS - AN OVERVIEW (Cont'd)


FIGURE 4. Eurhodia australiae (Duncan, 1877). A, adapical view of specimen in author's collection x 2; B, adoral view of specimen SAM P21953 x 1.8. Both specimens from Tortachilla Limestone, Maslin Bay, South Australia.

DESCRIPTION: Test small to medium, low to moderately inflated, basically elliptical in outline but with margin truncated posteriorly and well rounded to slightly elongated anteriorly; greatest width centrally; apex at posterior edge of apical system; interambulacrum 5 inflated on adapical surface anterior to the periproct; apical system anterior with four genital pores; petals narrow, open (but tapering distally), anterior and posterior pairs flush with test, extending just over half way to margin (av. 55%), anterior petal slightly raised, extending almost 3/4 distance to margin; pore pairs not conjugate, outer row of pore pairs elongate, inner row round; periproct supramarginal, oval shaped longitudinally and nearly vertical in deeply recessed groove commencing approx. 2/3 distance from apical system and extending to posterior margin; peristome anterior, pentagonal in shape with well developed bourrelets and fairly narrow phyllodes; adoral surface slightly depressed around peristome; tubercles very small adapically and immediately submarginal becoming considerably larger towards floscelle. [Note: Description based primarily on single well detailed specimen in the author's collection].

SIZE: Illustrated specimen (adapical surface) - length 32.3, width 23.9, height 13.0 [Maslin Bay, S.A.]; illust. spec. (adoral surface) - length 37.0, width 28.4, height approx. 17.0 [SAM P21953, Maslin Bay, S.A.].

Holotype - length 30.5, width 22.9, height 10.2 [Castle Cove, Victoria].

**Apatopygus vincentinus** (Tate, 1891)
Tate, 1891: 280 [not illustrated]
[Figs. 2D, 5A & B]

HISTORY: When Tate described the species in 1891, placing it in the genus Echinobrissus, he failed to include an illustration. In fact it does not appear to have ever been illustrated in a scientific journal, although Sadler et al. (1983) include two somewhat indistinct photographs in their book on "Sea urchins of the Murray River Cliffs". As with Eurhodia australiae [then also included in the genus Echinobrissus] it was reassigned to Nucleolites by H. L. Clark (1946). As previously stated, neither species belong in this latter genus. Its reassignment to Apatopygus, which is now widely accepted in Australia, appears to have also been made by Philip (1970), without comment or redescription. While the resemblance of some fossil specimens to the type species of the genus, the extant species Apatopygus recens (Milne Edwards, 1836) from New Zealand, are in many aspects quite remarkable, preservation of the former make a detailed comparison difficult.

RANGE: Late Eocene and Early Miocene

LOCALITIES: Tortachilla Limestone (Late Eocene), Maslin Bay cliffs, South Australia [St Vincent Basin].

Kingscote Limestone (Late Eocene ?), Kingscote, Kangaroo Island, South Australia [St Vincent Basin].

Toolinna Limestone and Wilson Bluff Limestone (Late Eocene), Toolinna Cave, Nullarbor Plain, Western Australia [Eucla Basin].

Abrakurrie Limestone (Early Miocene ?), Thylacine Hole, Nullarbor Plain, Western Australia [Eucla Basin].

Mannum Formation (Early Miocene), Murray River cliffs between Mannum and Bow Hill, South Australia [Murray Basin].

Gambier Limestone (Early Miocene ?), Glenelg River opposite Dry Creek on South Aust./Victoria border [Otway Basin].

Puebla Formation (middle Early Miocene), Point

AUSTRALIAN TERTIARY CASSIDULOIDS - AN OVERVIEW (Cont'd)


FIGURE 5. Apatopygus vincentinus (Tate, 1891). A, adapical view and B, adoral view of specimen in author's collection x 2.9. Specimen from Tortachilla Limestone, Maslin Bay, South Australia.

Danger, Torquay, Victoria [Otway Basin].
Note: Tate (1891) also refers to its occurrence at Muloowurtie, near Ardrossan, South Australia [St Vincent Basin].

DESCRIPTION: Test small to medium, slightly inflated, ovate in outline usually tapering to an evenly rounded anterior, and with posterior margin mildly truncated and recessed below periproct; greatest width and height posterior (about 60% test length); adoral surface transversely concave from anterior to posterior - only mildly so in small specimens but often pronounced in large; apical system anterior (about 40% TL) with four genital pores [refer also note in "General Morphology"]; petals narrow, open, rows of pore pairs parallel extending between 2/3 & 3/4 distance to ambitus, posterior petals longer than others continuing beyond anterior end of periproct; pore pairs do not appear to be conjugate; periproct supramarginal, oblique, oval shaped longitudinally in groove commencing half way from apical system and extending to posterior margin; peristome anterior, wider than long; single pores in each half ambulacrum prominent on adoral surface; bourrelets and phyllodes barely discernible, no buccal pores. [Note: Description based primarily on a single Late Eocene specimen in the author's collection. Early Miocene specimens

are usually much smaller and generally do not retain much detail. The possibility that there is more than one fossil species cannot be discounted].

SIZE: Illustrated specimen - length 22.5, width 16.6, height 8.4 [Maslin Bay, S.A.].
Holotype - length 28.5, width 23.0, height 12.0 ["Aldinga", S.A.].

**Cassidulus florescens** Gregory, 1892
Gregory, 1892: 435, pl.12/2-4
[Figs. 2C, 6A & B]

HISTORY: Classification unchanged.

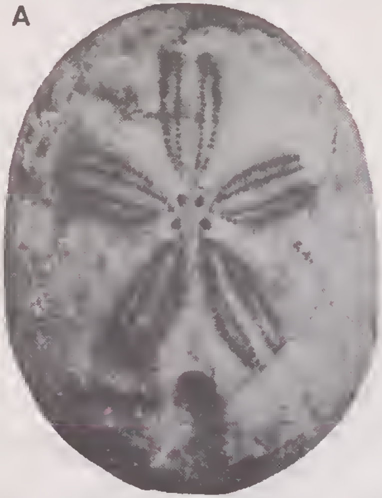
RANGE: Late Oligocene - Early Miocene (Janjukian - Longfordian).

LOCALITIES: Fyansford Hill, Moorabool River; 2.4 km. N.W. of Geelong, Victoria (Type locality - formation & age uncertain).
Point Addis Limestone (Late Oligocene), Aireys Inlet, Point Addis & Bells Headland (fallen boulders), Victoria [Otway Basin]
Waurn Ponds Limestone (Late Oligocene), Waurn Ponds, Victoria [Otway Basin].
Kawarren (formation & age uncertain), north of Gellibrand, Victoria [Otway Basin].
Puebla Formation ? (Early Miocene), Spring Creek near Torquay, Victoria [Otway Basin]. Refer Dennant & Kitson, 1903.
Port Willunga Formation (Oligocene - Early Miocene), Wool Bay, Yorke Peninsula, South Australia [St Vincent Basin].
Cold & Wet Station (formation & age uncertain), S.W. of Coonalpyn, South Australia [Murray Basin].
Gambier Limestone ?, Mt Gambier area, S. Australia [Otway Basin]. Refer specimen MV P79398 from T. S. Hall collection.
Abrakurrie Limestone (Early Miocene ?), Firestick Cave, Nullarbor Plain, Western Australia [Eucla Basin].

DESCRIPTION: Test medium, low to moderately inflated; adapical profile fairly evenly rounded both transversely and longitudinally except for a flattened posterior slope; outline an elongated ellipse with evenly rounded anterior and posterior ends; widest point and apex just posterior of centre; apical system anterior with four genital pores, petals flat, fairly narrow, open, of near equal length extending just over half way to margin anteriorly but only 40% posteriorly (do not extend past anterior end of anal

AUSTRALIAN TERTIARY CASSIDULOIDS - AN OVERVIEW (Cont'd)

A



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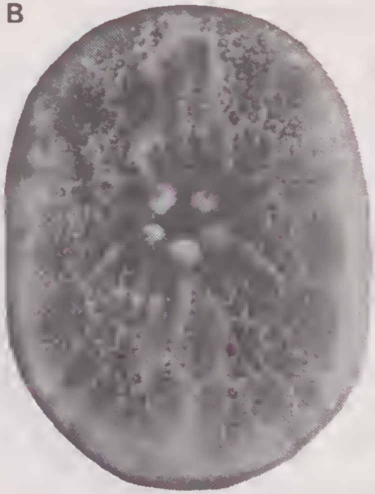

FIGURE 6. Cassidulus florescens Gregory, 1892. A, adapical view x 2.4; B, adoral view x 2.2. Both specimens in author's collection from Point Addis Limestone, Point Addis, Victoria.

groove); pore pairs conjugate although not often obvious due to weathering, outer pores elongate, inner round; periproct supramarginal, oblique, oval shaped longitudinally in shallow groove commencing just under halfway from apical system and extending posteriorly but not fully to margin; adoral very slightly depressed; peristome anterior, pentagonal in shape with very well developed bourrelets and wide phyllodes; tubercles small adapically and immediately submarginal becoming larger towards floscelle.

SIZE: Illustrated specimen (adapical surface) - length 27.5, width 20.9, height 12.0; illust. spec. (adoral surface) - length 29.7, width 22.4, height 13.3 [both Point Addis, Victoria].

Syntypes (Gregory, 1892) - A, length 22.0, width 17.0, height 9.0; B, length 19.5, width 15.5, height 8.0 [both from Fyansford Hill, Geelong].

**Studeria elegans** (Laube, 1869)
Laube, 1869: 190, fig. 8
[Figs. 2A, 7A & B]

HISTORY: Laube originally placed this species in the genus Catopygus. However, in 1889, Duncan erected the subgenus Studeria

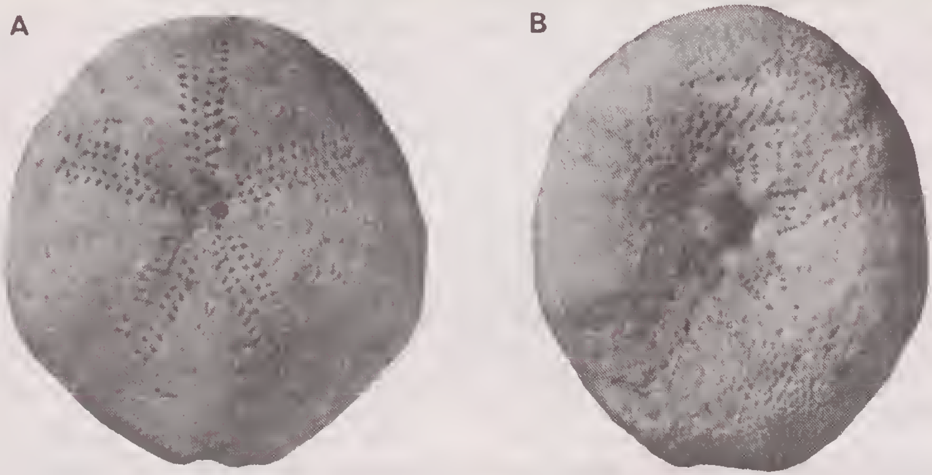


FIGURE 7. Studeria elegans (Laube, 1869). A, adapical view x 3; adoral view x 2.8; Both specimens in author's collection from the Mannum Formation, Murray River cliffs near Mannum, South Australia.

for the species, having noted that the ambulacra only have a single pore in each plate beyond the distal end of the petals, whereas Catopygus, being a late Jurassic to late Cretaceous form, has double pores. After much disagreement and confusion Studeria has been given full generic status with C. elegans as the type species (Kier, 1962).

RANGE: Late Oligocene ?, Middle Miocene.

LOCALITIES: Mannum Formation (Early Miocene), Murray River cliffs between Mannum and Walkers Flat, South Australia [Murray Basin].

Gambier Limestone (Early Miocene ?), Glenelg River cliffs north of Nelson, South Australia & Victoria [Otway Basin].

Port Campbell Limestone, Muddy Creek Marl Member (late Early to Middle Miocene), Clifton Bank, Muddy Creek, near Hamilton, Victoria [Otway Basin].

Puebla Formation ? (Early Miocene), Spring Creek near Torquay, Victoria [Otway Basin]. Refer Chapman, 1908. Note: Dennant & Kitson, 1903, also record Studeria from Mt Gambier, South Australia and Apsley, Victoria.

DESCRIPTION: Test small to medium, inflated (height slightly more than 60% TL), oval in outline with smoothly rounded anterior

AUSTRALIAN TERTIARY CASSIDULOIDS - AN OVERVIEW (Cont'd)

margin and subangular posterior margin; widest point and apex about the centre; apical system anterior with three genital pores; petals straight, narrow, open, flush with test, medium to long in length (range 55% to 75% distance to ambitus), anterior petal longest, posterior petals shortest; pore pairs conjugate, single pores in ambulacra fairly prominent from distal end of petals to phyllodes; periproct small, oval vertically, mid height at top of small elongated recess in slightly truncated posterior margin; adoral surface slightly concave in centre, interambulacrum 5 moderately inflated and ambulacra I & V depressed between ambitus and floscelle; peristome small, just anterior of centre, oval to pentagonal longitudinally; bourrelets well developed, phylodes wide; tubercles small.

SIZE: Illustrated specimen (adapical surface) - length 19.6, width 18.3, height 12.2; illust. spec. (adoral surface) - length 22.0, width 18.7, height 13.5 [both Murray River cliffs].

Holotype - length 23.0, width 20.0, height 13.0 [Murray River cliffs].

Largest specimen recorded by author (Studeria cf. elegans, Fig. 2B) - length 32.3, width 27.9, height 22.8 [Cowirra Swamp Road, east side of Murray River, Mannum, S.A.].

DETAILS AND DISTRIBUTION OF SPECIES TO BE CONTINUED IN THE NEXT BULLETIN

## GLOSSARY OF TECHNICAL TERMS

**adapical** - towards the apical system (top).

**adoral** - towards the mouth (underside).

**ambitus** - greatest horizontal circumference of test (see also margin).

**ambulacra** (sing. **ambulacrum**) - five radially arranged test segments of pore bearing plates extending from the apical system to the peristome & overlying the radial water vessels.

**anterior** - in front of the transverse centre line of the test (towards the margin of ambulacrum III).

**apex** - highest part of test.

**apical system** - small plates (oculars & genitals) at the adapical end of the ambulacra & interambulacra (fig. 1A & 1B).

**aristotle's lantern** - complex system of calcareous skeletal elements (jaws) used for mastication [not found in adult Cassiduloids].

**bourrelet** - externally inflated adoral part of interambulacrum near mouth (part of floscelle).

**buccal pores** - ambulacral pores situated between the bourrelets, immediately adjacent to the peristome, through which tube feet extend.

**conjugate pores** - pores of pair connected by groove in external surface of test.

**distal** - situated away from a central point.

**fasciole** - narrow band of ciliated spines which articulate with very fine tubercles and so appear as a relatively smooth band on a fossil test [not found on Cassiduloids].

**floscelle** - star shaped area around peristome formed by phyllodes & bourrelets.
**food grooves** - narrow grooves leading to the mouth, primarily in adoral ambulacral areas [not found on Cassiduloids].
**genital pores** - pores situated in the genital plate(s) of the apical system for the discharge of eggs or sperm.
**genital plate** - plate lying in the apical system at the top of the interambulacrum, and pierced by pore(s), for the discharge of eggs or sperm.
**interambulacra** (sing. **interambulacrum**) - five radially arranged test segments, lacking pores and alternating with the ambulacra, extending from the apical system to the peristome.
**madreporite** - perforated genital plate in the apical system through which water enters the water vascular system (fig. 1A & 1B).
**margin** - edge of test in flattened echinoids (see also ambitus).
**ocular plate** - plate of apical system at termination of ambulacrum, pierced by the ocular pore (fig. 1A & 1B).
**ocular pore** - perforation in the ocular plate for passage of the terminal tentacle of the radial water vessel.
**periproct** - opening in test for anus.
**peristome** - opening in test for mouth.
**petal** - the adapical part of the ambulacrum shaped like a petal and lying adjacent to the apical system in irregular echinoids with tube feet.
**phyllode** - area of enlarged pores in adoral portion of ambulacrum near mouth (part of floscelle).
**plastron** - a broad, inflated extension of the posterior interambulacrum occurring on the adoral side of the test towards the mouth [not found on Cassiduloids].
**pore pair** - two close set openings in an ambulacral plate through which a single tube foot passes.
**posterior** - to the rear of the transverse centre line of the test (towards the margin at interambulacrum 5).
**submarginal** - below the margin or ambitus (adorally).
**supramarginal** - above the margin or ambitus (adapically).
**test** - the entire system of echinoid plates (skeleton), including the apical, coronal, periproctal & peristomal systems.
**TL** - test length.
**truncated** - ending abruptly as if cut off at end.
**tube feet** - slender, extensible tentacles connected with the water vascular system and found in the ambulacra. They function mainly in locomotion, feeding & respiration.
**tubercles** - knob like structures on outer surface of test to which spines are attached.
**water vascular system** - the hydraulic system of tubes through which water is circulated to the tube feet.

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AUSTRALIAN TERTIARY CASSIDULOIDS - AN OVERVIEW (Cont'd)

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# FOSSIL PEDICELLARIAE

Ken Bell, Stony Creek, South Gippsland, Victoria.

One of the more unusual, and rarely found of the microfossils, are the pedicellariae.

Pedicellariae (sing. pedicellaria) are minute defensive and scavenging organs of echinoids and asteroids. In spite of their small size (usually less than 1 mm, but occasionally reaching 5 mm long) they are considered to be important in the classification of Recent echinoids, both at the specific and higher taxonomic levels. Very few records of fossil pedicellariae have been made and because of their apparent rarity no use is made of them in the classification of fossil echinoids.

A typical pedicellaria of a living echinoid consists of a muscular stem stiffened by a calcareous rod surmounted by a moveable head, usually built of three jaw-like valves. The proximal end of the stem is usually enlarged and connected by muscles to a small tubercule on the test surface. The whole is usually in constant motion. Pedicellariae may be found on almost every part of an echinoid test, although different forms may be restricted to specific parts. More than one type of pedicellaria may be found on a test.

There are four main types and briefly their characteristics are:-

(a) Tridentate - comprise 3 long pointed valves without poison glands or terminal teeth; these are the largest pedicellariae, 0.5 - 5 mm long;
(b) Globiferous - the head in this form is usually globular

FOSSIL PEDICELLARIAE (Cont.)

when closed and the valves contain pits or chambers in which are found poison secreting glands (size 0.1 - 1 mm);

(c) Ophicephalous - valves are large and ovate, blunt ended, with serrate margins and may or may not have poison glands;

(d) Triphyllous - of very small size (less than 0.3 mm) with flattened, finely toothed valves which are not hinged together. The pedicellariae of asteroids can be readily distinguished from those of echinoids as they are always bifid and have a different articulation method.

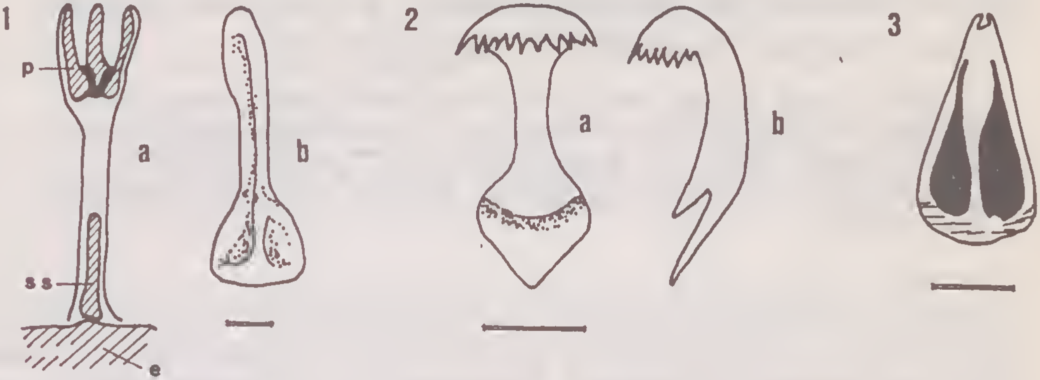
FIGURE 1. SEM photograph of tridentate pedicellaria. Scale bar equals 1 mm.

From direct observation pedicellariae are known to play two important roles - they can defend the echinoid or asteroid against predators and small parasites by snapping the valves open and shut, and also rid the test of foreign debris by passing particles along from head to head.

After death of the animal they are easily detached from the test and so are rarely reported as fossils.

To my knowledge fossil pedicellariae have only been reported from eight sites prior to their recent finding in Eastern Victoria. The first recorded (Groom, 1887) were of three varieties attached to a test of Pelanechinus corallinus from the Jurassic of Great Britain. Other forms attached to tests have been reported from the Jurassic and Triassic of France. Isolated valves have been found in the Carboniferous of Texas, Illinois and Missouri, Permian of Kansas, Cretaceous of Denmark and possibly from the Eocene of Italy.

In a recent study of acid-digested limestones and marly-limestones from the Buchan-Bindi area of Eastern Victoria, several tridentate pedicellariae have been recovered. The samples come from the Buchan Caves Limestone and from the Taravale Formation and are Early Devonian in age. Echinoderms have not been recovered from these sediments (Teichert and Talent, 1958). Although it is not possible to say from which genus these fossil pedicellariae came, they do show the presence of echinoderms in the biota at the time when these sediments were forming and that the lack of other echinoderm remains (tests, isolated ambulacral interambulacral plates, lantern plates and spines) must be due to some preservational effect. It



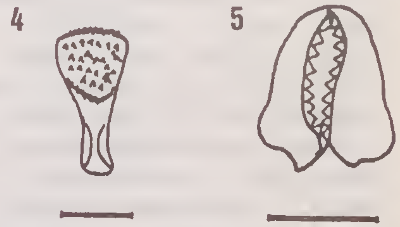




FIGURE 2. 1a, typical morphology of a Recent pedicellaria, p - pedicellaria, ss - stem spicule, e - echinoid test; 1b, typical tridentate pedicellaria. 2. Ophicephalous form. 3, Globiferous form. 4, Triphyllous form 5, Asteroid pedicellaria. Figs. 2 - 5 after Geis, 1936.
Scale: 1,2,4 & 5 = 0.1 mm., 3 = 0.5 mm.

also indicates the great usefulness of microfossils in helping to understand and complete our knowledge of living faunas in the past.

It is strange that, although the Victorian-South Australian Tertiary beds are rich in echinoids, no pedicellariae have yet been reported. Perhaps their size and also the lack of knowledge of what they are may have stopped them being reported. Anyone collecting well preserved echinoid tests would do well to take care in cleaning them and see if pedicellariae occur on the tests.

The study of pedicellariae from the Palaeozoic can help in understanding evolutionary relationships between the echinoid and asteroid families. There is also the possibility that they could be used as stratigraphic index fossils.

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# FOSSIL COLLECTING IN QUEENSLAND - A PERSONAL RECORD

Robert Knezour, East Ipswich, Queensland.

In the following article, amateur collector, Robert Knezour describes the material he has collected while living in Queensland, mainly around Brisbane in the south east of the State. Because of the predominance of early Mesozoic terrestrial sediments in this area and the need to use public transport, his collecting has for the most part been restricted to plant fossils.

I became interested in fossil collecting while living in Mt.Isa, Queensland. A geologist friend, working at Mary Kathleen mine, was prospecting for mineral deposits on May Downs station, and came across some fine trilobite specimens which he later showed to me. These were later identified as <u>Xystridura templetonensis</u>.

Armed with a four wheel drive vehicle and a mud map, the locality was eventually found and numerous trilobites discovered weathering out from several low topped hills amid the spinifex. This site is not the famous Cambrian Beetle Creek locality near May Downs homestead, but situated a few miles south and west and surely part of the same deposit.

Five years ago I moved to Brisbane where I stayed for two years, and finally to Ipswich, about 30 kilometres west of Brisbane.

While in Brisbane I visited two quarries regularly to search for Triassic plant fossils. These are located at Tingalpa and Narangba. Permission to enter both sites was obtained.

Sometimes an owner or quarry worker will be unaware of the presence of fossils, at others they can give good pointers as to the location of interesting sediments.

Both of these sites were being economically mined on a small scale for clay used in the manufacture of pavers, pipes etc.

The first locality is situated in the Tingalpa Formation, at the corner of Wynnum and Murrarie Roads, Tingalpa, and has yielded some well preserved carbonised plant fossils in a thin seam on the south side of the quarry. <u>Cladophlebis australis</u>, <u>Ginkgo digitata</u>, <u>Heidiphyllum elongatum</u> and <u>Yabeiella</u> species were found.

This site is also home to a large colony of sundews on the western rim of the quarry near the entrance.

The Narangba locality is located in one of three quarries operated by P.G.H., on the western side of Omara Road, two kilometres north of Narangba railway station.

The quarries are marked on the Caboolture 1:100,000 Geological Sheet. The fossil plant localities marked on the sheet in this area probably refer to fossils found in the nearby railway cuttings to the east of Omara Road.

The quarries are old but still used occasionally to provide a blend in the pottery making process. The material is a fine grained, cream coloured sandstone with fossils preserved as chocolate brown impressions. After rain the quarry becomes a sodden quagmire.

All three connecting pits have been investigated and plant fossils have been found in the northernmost pit. These include horsetail fructifications, numerous small leaves of 1-2 cms., conifer foliage and a large number of other indentical fructifications. All fossils were collected in association with each other in a small area on the south face of the pit.

I later approached the Queensland Mines Department to compare these fossils with any previously collected while mapping the district, but unfortunately there were none. However, Mr. John Rigby, Senior Geologist at the Mines Department, was able to identify the "large number of other identical fructifications" as a new species and is currently describing them as his work allows.

Shortly before moving to Ipswich I had made several trips to the area looking for Triassic plants around the coal mine waste tips at Ebbw Vale and Dinmore. The Ipswich 1:100,000 Geological Sheet is a bit dated and shows fossil plant localities which have since been built upon. However, there are some good fossils to be found including <u>Dicroidium</u> <u>odontopteroides</u>, <u>Xylopteris</u> species,<u>Cladophlebis</u> <u>australis</u>, both sterile and fertile fronds, also <u>Rienitsia</u> species and associated fructifications and horsetails.

I spoke to F.C.A.A., member Mr. Cyril Wheeler on the telephone and he kindly offered to show me some of the better fossil sites in the district and we spent much of the day at three localities at Brassal, Blackstone and Dinmore. The last two named are still my richest sites for Triassic plants in Ipswich. Both belong to the Blackstone Formation, Brassal Sub Group, of the Ipswich Coal Measures.

FOSSIL COLLECTING IN QUEENSLAND (Cont.)

The Blackstone locality, Castle Hill, is a wooded hilltop and although the nearest houses are only 200 metres away, it is a quietly wild place of acacias, gums and native shrubs. There is the occasional Brown snake or wallaby and always a few kookaburras.

There was once a house on the hilltop, hence the name Castle Hill, and some of the foundations are visible, however, there are burning coal seams underground which have made the site unsafe for habitation.

The fossil bearing sediments are a very hard grey shale, although some fossils have been found in coarse grained sandstone at the site. Interestingly, I have found a single fructification in this sandstone, very similar to those of the new species from Narangba. This I presented to John Rigby.

There is a huge amount of non-fossil or waste material but the nature and quality of some of the specimens makes the effort worthwhile.

The number of different species found at this locality is not great but the site is distinguished by the large number of Dicroidium seed fern fructifications found. Both the male Pteruchus and the female Umkomasia are common. Pteruchus and Umkomasia were first recognised as Dicroidium fructifications by H.H.Thomas (1933) from material collected from the Molteno Formation in the Upper Umkomaas Valley of Natal, South Africa.

It would be ideal to find either or both of the fructifications actually attached to a Dicroidium species. This may never happen but you have to look on the bright side!

The total number of specimens collected as of this date is 235, with the species represented as follows :-

| | |
|---|---|
| Dicroidium odontopteroides present in | 54% of the specimens. |
| Umkomasia ........................ | 40% |
| Pteruchus ........................ | 21% |
| Xylopteris spinifolia .............. | 20% |
| Xylopteris tripinnata .............. | 8% |
| Linguifolium sp./Doratophyllum sp. .. | 6% |
| Ginkgophyllum sp./Ginkgo digitata/ Ginkgoites ginkgoides .............. | 6% |

Taeniopteris sp. .................... 2.5%
Cladophlebis australis ............. 0.8%

The specimens of Cladophlebis australis are fertile showing Asterotheca type fructifications.

As can be seen, Umkomasia or Pteruchus are present in 61% of all specimens found at this site which must make it one of the richest sites in Australia. I have been trying to find someone to describe this assemblage, without success. There are so many finds to research and describe and so few qualified or in the position to do the work.

While working the Blackstone site, I made the occasional trip to Redbank Plains, about 15 kilometres ESE of Ipswich, to look for Eocene fossils in the Redbank Plains Formation.

My attention was drawn to the area after a visit to the Geology Museum at the Queensland University in St.Lucia,Brisbane. Some fossil fish were on display labelled as being from Redbank Plains. The Museum staff were unable to give the precise location of the site but Andrew Rozefelds, at the time, resident palaeobotanist at the Queensland Museum was able to suggest an area in which to look.
Andrew suggested the bushland on the north side of Brittains Road, opposite the Council tip and to look for ironstone or mudstone bands in the soil thereabouts.

Fossil insect localities are also marked on the Ipswich 1:100,000 Geological Sheet in this area.

The first few trips were fruitless but I did find two species of native orchid on the bank of one of the gullies - Acianthus sp. and Pterostylis sp., as well as some native flowering Ajuga australis.

On a later visit I was about to leave for home but decided to try one last path where I found a muddy piece of fine grained ironstone which I took with me. On cleaning, the ironstone revealed scattered fish remains, a small pair of gum nuts and a beautifully preserved insect complete with head, thorax, abdomen and wings. The specimen was taken to the Queensland Museum for confirmation and donated on request.

Two more visits to the site unearthed other insects, insect wings,

FOSSIL COLLECTING IN QUEENSLAND (Cont.)

various dicotyledenous leaves, including a fine Banksia type leaf, 115mm long, as well as fish remains, including a complete specimen 20cm in length. All of these were taken to the Queensland Museum and again donated on request except the Banksia type leaf which I kept.

Shortly afterwards Andrew Rozefelds, Ralph Molnar, two others and I spent a day collecting at the new locality. We found insects,plants and fish and what was found to be part of the foot of an extinct bird, about the size of a bustard. This specimen is currently being studied by Patricia Rich at Monash University and is now considered to be the second oldest bird fossil in Australia. It is not known if the bird could fly. Sadly no mammal fossils were found.

Since the last visit in September 1990, the site has been left undisturbed so that new material may weather out from the hillsides and gullies.

The Dinmore site shown to me by Cyril Wheeler was now investigated. The actual location is one of several small quarries located in bushland at the southern end of Robert Street, Dinmore. The area contains several abandoned clay pits with sediments of Eocene age, which are part of the Redbank Plains Formation. Many dicotyledenous leaves can be found but the clay is brittle and good specimens are difficult to obtain.

The Triassic site is only 100 metres south and is a small clay/shale pit of approximately 10 square metres. It is presently owned and operated by Claypave.
Although the site appears undistinguished at first, appearances are deceptive and the site is extremely rich in Late Triassic flora.

A hammer and cold chisels are required to enable sheets of the horizontally bedded sediments to be lifted and split. Great aftercare must be taken with any specimens collected as they will readily crumble to pieces if left exposed to the elements.

The site is a famous one and over the years many plant species have been recovered.

Due to the small size of some of the species, all material should be carefully scanned with a hand lens.

Species in the collection from Dinmore include :-

| | |
|---|---|
| Equisetales | - Neocalamites species (?) |
| Cycadophyta | - Linguifolium species. Pterophyllum multilineatum Taeniopteris species. |
| Filicales | - Cladophlebis australis. Sterile and fertile. Asterotheca. |
| Ginkgoales | - Ginkgoites simmondsi, Ginkgo digitata. Other unidentified Ginkgo leaves. Ginkgophyllum species. |
| Pteridospermae | - Dicroidium odontopteroides, Dicroidium eskense Xylopteris elongata. Many other intermediate forms as yet unidentified. At least two species of Pteruchus and many Umkomasi although not nearly as common as at Blackstone. |

Also the winged seeds Fraxinopsis major, of possible Conifer origin; several other unidentified fructifications; an insect wing; leaf mine damage on Heidiphyllum elongatum, and Euestheria species - an estheriid conchostracan (a type of freshwater valved shrimp).

My most recent find is a male conifer fructification, a mass of pollen sacs, length 65mm, width 15mm, on a stem 70mm long. Leaf scars are visible and one can see with a hand lens where the vascular bundles would have connected the leaves to the stem. There were no conifer leaves found associated with this fructification.

In July 1989, I was offered a day trip by sympathetic friends, Dave and Moira Wood, (as I do not own a vehicle), to seek fossil sites in the Esk Formation, approximately 40 kilometres NW of Ipswich.

Not having been in the district before, it was some time before we realised that many of the sites we were seeking from localities marked on the Caboolture 1:100,000 Geological Sheet were under the water of the new(?) Wivenhoe Dam catchment area.

We eventually found two unmarked sites by stopping at likely looking road cuttings.

The first is located 500 metres along the north branch of the crossroads at the Coominya Crossing. This road continues for another 500 metres and ends at the waters edge. The site is a

FOSSIL COLLECTING IN QUEENSLAND (Cont.)

shallow road cutting and we found a few specimens of Cladophlebis australis and several specimens of Neocalamites species, incomplete stems with short, broad internodes and linear leaves arising from the nodes.

The second site is a deeper road cutting located on the road to Esk, NW of Paddys Gully. From here we extracted nearly 50 specimens including Dicroidium odontopteroides; other Dicroidium species including eskense; Ginkgo species; Taeniopteris species; Cladophlebis species; Asterotheca and several unidentified fructifications. One interesting find is a specimen of Neocalamites species with an attached strobilus, which is rare or unknown in the Ipswich area although Jones and De Jersey (1947) mention two detached strobili of possible Equisitale origin. Although this site has great potential it is not the safest of sites due to the traffic roaring past. In addition, I am sure the Main Roads Department would not appreciate people demolishing their road cuttings.

There are many other sites in the Ipswich district worthy of investigation and I hope, in time, to explore some of them, especially the Jurassic Walloon Coal Measures to the west.

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## OVERSEAS COLLECTOR WISHING TO TRADE

Heinz Kranz, Kunibertusplatz 7, Gymnich, 5042 Erftstadt 13, Germany, wishes to trade German fossils for Australian specimens. In exchange, he can offer ammonites from Germany, fishes and gastropods from France and echinoids from Spain.

# RECORDS OF VICTORIAN TRILOBITES

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The following list includes all trilobites that have been described and figured from Victorian rocks. Not included in the list are trilobites that have been recorded in the literature without illustration and description, as in most cases the relevant material cannot be traced and the records cannot therefore be checked.

The list is divided into three parts. The first part includes records of named species, the second part includes trilobites that have been assigned to a genus but not to a species, and the third part includes trilobites not assigned to a genus.

In the first part of the list, entries are arranged alphabetically by species name. Following the species name, the first line of each entry includes the authorship of the species and the genus to which the species was originally assigned in Victoria. If the species was originally based on material from outside Victoria, the generic assignment given on the first line may differ from that originally proposed by the author of the species; if this is the case, the author's name and year of erection are placed in parentheses, as is customary. Subsequent lines of each entry record published references to the species, with an indication of the genus to which the species was assigned by later authors, if different from the genus quoted on the first line. The final part of each entry lists age, stratigraphic and locality information. Type localities of species are followed by an asterisk; if none of the localities is marked by an asterisk, the species is based on material from outside Victoria.

In the second part of the list entries are arranged alphabetically by genus, and in the third part they are arranged by family or subfamily names. The remainder of each entry in these parts is similar in arrangement to that in part 1.

Throughout the list, I have in nearly all cases refrained from making personal taxonomic judgements. Thus, although the most recently published name for each trilobite may be easily determined, it should not be assumed that this is the name I consider to be taxonomically correct.

RECORDS OF VICTORIAN TRILOBITES (Cont'd)

## NAMED SPECIES

**aborigenum** Öpik, 1953, **Dalmanitina** (Eudolatites)
Öpik 1953: 26, pl. 10, figs 85-87, text-fig. 9.3.
"Dalmanitina" aborigenum. - Talent 1965: 50.
Early Silurian, Late Llandovery, Wapentake Formation, Heathcote district*.

**angustior** Chapman, 1915, **Calymene**
Chapman 1915: 164, pl. 15, figs 8,9 (non pl. 15, fig. 10 = Gravicalymene hetera Gill, 1945).
Calymene (Gravicalymene) angustior. - Gill 1942: 45. - Talent 1963: 105, pl. 74, figs 5-9, pl. 76, figs 12-15.
Gravicalymene angustior. - Gill 1945: 176, pl. 7, figs 5, 10. - Philip 1962: 231, pl. 35, figs 16, 17).
non Gravicalymene cf. angustior. - Talent 1965: 49, pl. 26, figs 3-5 (= Sthenarocalymene sp. A).
Apocalymene angustior. - Chatterton, Johnson & Campbell 1979: 813.
Sthenarocalymene angustior. - Holloway & Neil 1982: 143.
Early Devonian, Lochkovian, Humevale Formation, Chirnside Park*. Early Devonian, Pragian; Boola Formation, Tyers area, Gippsland (Philip 1962); Coopers Creek Limestone?, Coopers Creek, Gippsland (Gill 1945); Tabberabbera Formation, Kilgower Member, Tabberabbera (Talent 1963).

**athamas** Öpik,1953, **Dalmanites**
Öpik 1953: 28, pl. 10, figs 88-91, text-fig. 9.4.
Dalmanites? athamas. - Talent 1965: 50.
Early Silurian, Late Llandovery, Wapentake Formation, Heathcote district*.

**australiensis** Chapman, 1911, **Agnostus**
Chapman 1911: 314, pl. 58, figs 9, 11, 12. - Chapman 1917: 98.
Ptychagnostus australiensis. - Thomas & Singleton 1957: 158.
Middle-Late Cambrian, Dolodrook Limestone, Dolodrook River*. Middle Cambrian, Knowsley East Formation, Heathcote district (Chapman 1917).

**australis** McCoy, 1876, **Lichas**
McCoy 1876: 18, pl. 22, fig. 11a, b. - Gill 1939: 140, pl. 5, figs 1, 2.
Acanthopyge australis. - Etheridge & Mitchell 1917: 504. - Gill 1947: 14. - Gill 1951: 35, pl. 2, figs 3-6.
Acanthopyge (Lobopyge) australis - Chatterton, Johnson & Campbell 1979: 822. - Holloway & Neil 1982: 152.
Early Devonian, Lochkovian, Humevale Formation, Woori Yallock* and Killara (Gill 1939).

**bispinosa** Philip, 1962, **Leonaspis**
Philip 1962: 230, pl. 21, fig. 1, pl. 35, figs 6-13, text-fig. 17.
Early Devonian, Lochkovian, Boola Formation, Tyers area, Gippsland*.

cf. **blumenbachi** Brongniart, 1822, **Calymene**
Chapman 1915: 166, pl. 15, fig. 11 - Gill 1945: 171 (specimen considered indeterminate).
Early Devonian, Lochkovian, Humevale Formation, Coldstream.

**bowiei** Gill, 1945, **Calymene**
Gill 1945: 172, pl. 7, figs. 1, 2, 6.
Early Devonian, Lochkovian, Humevale Formation, Killara*.

**bowningensis** Mitchell, 1888, **Cyphaspis**
Chapman 1915: 162, pl. 14, fig. 5, pl. 16, fig. 18.
Early Devonian, Zlichovian, Norton Gully Sandstone, Mansfield district.

**caudatus** (Brünnich, 1781), **Phacops (Odontochile)**
McCoy 1876: 13, pl. 22, figs 1-7, pl. 23, figs 7-10 (see Dalmanites wandongensis).

**collusor** Öpik, 1953, **Thomastus**
Öpik 1953: 24, pl. 9, figs 72-74. - Talent 1965: 47.
Early Silurian, Late Llandovery, Wapentake Formation, Heathcote district*.

**cresswelli** Chapman, 1915, **Goldius**
Chapman 1915: 160, pl. 14, fig. 3, pl. 16, fig. 17.
Early Devonian, Pragian, Coopers Creek Limestone, Coopers Creek, Gippsland*.

**crossleii** Etheridge & Mitchell, 1896, **Phacops**
Chapman 1915: 168, pl. 15, figs 14, 15 (see Acastella frontosa and Acaste longisulcata).

**darraweitensis** Campbell, 1973, **Dalmanitina (Dalmanitina)**
Campbell 1973: 74, figs 2-7.
Songxites darraweitensis. - VandenBerg, Rickards & Holloway 1984: 15, fig. 13A-R.
Late Ordovician, Bolindian, Darraweit Guim Mudstone, Darraweit Guim*.

**diggerensis** Jell, 1985, **Pseudokainella**
Jell 1985: 69, pl. 24, figs 5-14, pl. 25, figs 1-13.
Early Ordovician, Tremadoc, Digger Island Formation, Waratah Bay*.

**douglasi** Harrington, 1937, **Leiostegium**
Jell 1985: 63, pl. 22, figs 1-10.
Early Ordovician, Tremadoc, Digger Island Formation, Waratah Bay.

**droseron** Holloway & Neil, 1982, **Scutellum**
Holloway & Neil 1982: 135, fig. 2P-V.
Early Devonian, Lochkovian, Mount Ida Formation, Unit 3, Heathcote district*.

**eckardti** Jell, 1985, **Neoagnostus**
Jell 1985: 58, pl. 19, figs 1-5.
Early Ordovician, Tremadoc, Digger Island Formation, Waratah Bay*.

RECORDS OF VICTORIAN TRILOBITES (Cont'd)

**elizabethae** Jell, 1985, **Landyia**
Jell 1985: 75, pl. 30, figs 5-11, pl. 31, figs 1-5.
Early Ordovician, Tremadoc, Digger Island Formation, Waratah Bay*.

**enormis** Etheridge, 1894, **Bronteus?**
Etheridge 1894: 194, pl. 11, figs 1, 2.
Early Devonian, Delatite*.

**erquensis** Kobayashi, 1937, **Shumardia**
Jell 1985: 60, pl. 19, figs 15-19.
Early Ordovician, Tremadoc, Digger Island Formation, Waratah Bay.

**etheridgei** Chapman, 1911, **Crepicephalus**
Chapman 1911: 319, pl. 58, figs 4?, 8, pl. 59, figs 20?, 21? - Thomas & Singleton 1957: 158.
Middle-Late Cambrian, Dolodrook Limestone, Dolodrook River*.

**euryceps** McCoy, 1876, **Forbesia**
McCoy 1876: 17, pl. 22, fig. 10, 10a.
Proetus euryceps. - Chapman 1915: 161, pl. 14, fig. 4,
Late Silurian, Ludlow, Kilmore Siltstone, Kilmore district*.
Early Devonian, Lochkovian, Humevale Formation, Chirnside Park (Chapman 1915).

**expansus** Jell, 1985, **Australoharpes**
Jell 1985: 74, pl. 27, fig. 2, pl. 28, figs 1-10.
Early Ordovician, Tremadoc, Digger Island Formation, Waratah Bay*.

**fecundus** Barrande, 1846, **Phacops (Portlockia)**
McCoy 1876: 15, pl. 22, figs 8, 9, pl. 23, figs 1-6.
Phacops fecundus. - Gill 1938: 169, fig. 2,
Phacops sp. nov. - Gill 1951: 37.
Early Devonian, Lochkovian, Humevale Formation, Coldstream.

**fergusoni** Gregory, 1903, **Notasaphus**
Gregory 1903: 155, pl. 26, figs 11-13. - Chapman 1917: 100.
Kootenia fergusoni. - Thomas & Singleton 1957: 155. - Morris & Fortey 1985: 82, pl. 1, fig. 4.
Middle Cambrian, Knowsley East Formation, Heathcote district*.

**formosa** Gill, 1948, **Odontochile**
Gill 1948: 20, pl. 2, figs 1, 2. - Gill 1949b: 128, pl. 14, fig. 8. - Holloway in Jell & Holloway 1983: 7, fig. 4.
cf. Dalmanitidae gen. indet. B. - Talent 1965: 51, pl. 27, fig. 1.
cf. Dalmanitidae gen. indet. C. - Talent 1965: 51 (partim.), pl. 27, figs 6, 8 (not pl. 27, fig. 7 = Acastella sp.).
cf. Odontochile cf. formosa. - Holloway & Neil 1982: 147, fig. 6M-U.
Early Devonian, Lochkovian, Humevale Formation, Kinglake West*; Mount Ida Formation, Unit 3, Heathcote district

(Holloway & Neil 1982). Late Silurian-Early Devonian, Christmas Hills (Holloway in Jell & Holloway 1983).

cf. fraudator Ross, 1951, **Parahistricurus**
Jell 1985: 60, pl. 20, figs 1-3.
Early Ordovician, Tremadoc, Digger Island Formation.

**frontosa** Shergold, 1968, **Acastella**
Phacops crossleii Etheridge & Mitchell, 1896. - Chapman 1915: 168 (partim.), pl. 15, fig. 14 (non pl. 15, fig. 15 = Acaste longisulcata Shergold, 1968).
Acastella frontosa. - Shergold 1968: 23, pl. 3, figs 1-4, pl. 4, figs. 1-6.
Early Devonian, Lochkovian, Humevale Formation, Chirnside Park*.

**greenii** Chapman, 1915, **Goldius**
Chapman 1915: 158, pl. 14, figs. 1, 2.
Early Devonian, Lochkovian, Humevale Formation, Chirnside Park*.

cf. **hamulus** (Owen, 1852), **Saratogia**
Chapman 1917: 99, pl. 7, fig. 23.
Middle Cambrian, Knowsley East Formation, Heathcote district.

**harrisoni** McCoy, 1876, **Homalonotus**
McCoy 1876: 19, pl. 23, fig. 11.
Trimerus harrisoni. - Gill 1949a: 64, text-fig. 1A.
Late Silurian, Ludlow, Melbourne Formation, Moonee Ponds Creek, Flemington*.

**hetera** Gill, 1945, **Gravicalymene**
Calymene angustior Chapman 1915: 164 (partim.), pl. 15, fig. 10 (not pl. 15, figs 8, 9).
Gravicalymene hetera Gill 1945: 179, pl. 7, fig. 12).
Apocalymene hetera. - Chatterton, Johnson & Campbell 1979: 813.
Sthenarocalymene hetera. - Holloway & Neil 1982: 143.
Late Silurian, Ludlow, Kilmore Siltstone, Kilmore district*.

**hoeki** (Kobayashi, 1939), **Micragnostus**
Jell 1985: 57, pl. 19, figs 6-14.
Early Ordovician, Tremadoc, Digger Island Formation, Waratah Bay.

**holmesorum** Jell, 1985, **Victorispina**
Jell 1985: 77, pl. 29, figs 1-13, pl. 30, figs 1, 3-5.
Early Ordovician, Tremadoc, Digger Island Formation, Waratah Bay*.

**ida** Etheridge, 1896, **Dinesus**
Etheridge 1896: 56 (partim.), pl. 1, figs 1-4 (non pl. 1, figs 5, 6 = Notasaphus fergusoni Gregory, 1903). - Gregory 1903: 155, pl. 26, figs 8-10. - Chapman 1917: 98, pl. 7, figs 19-22. - Thomas & Singleton 1957: 155.
Middle Cambrian, Knowsley East Formation, Heathcote district*.

RECORDS OF VICTORIAN TRILOBITES (Cont'd)

**jutsoni** Chapman, 1912, **Illaenus**
Chapman 1912: 295, pl. 61, figs 4, 5. - Gill 1952: 42, fig. 1. - Öpik 1953: 25, pl. 9, fig. 80.
Early? Silurian, Llandovery?, Anderson Creek Formation; Bulleen*, North Balwyn (Gill 1952).

**killarensis** Gill, 1945, **Calymene**
Gill 1945: 174, pl. 7, figs 3, 4, 8.
Early Devonian, Lochkovian, Humevale Formation, Killara*.

**kilmorensis** Gill, 1945, **Gravicalymene**
Gill 1945: 180, pl. 7, fig. 9.
cf. Gravicalymene cf. kilmorensis. - Gill 1945: 181, pl. 7, fig. 7.
Apocalymene kilmorensis. - Chatterton, Johnson & Campbell 1979: 813.
Sthenarocalymene kilmorensis. - Holloway & Neil, 1982: 143.
Late Silurian, Ludlow; Kilmore Siltstone, Kilmore East*; Melbourne Formation, Moonee Ponds Creek.

**kinglakensis** Gill, 1947, **Dicranurus**
Gill 1947: 9, pl. 3, figs. 1-3.
Early Devonian, Lochkovian, Humevale Formation, Kinglake West*.

**kinglakensis** Gill, 1949, **Trimerus**
Gill 1949a: 67, pl. 8, figs 1-3, pl. 9, figs 3, 5, 6.
Early Devonian, Lochkovian, Humevale Formation, Kinglake West*.

**lilydalensis** Chapman, 1915, **Cyphaspis**
Chapman 1915: 163, pl. 14, fig. 6, pl. 16, fig. 19.
Early Devonian, Lochkovian, Humevale Formation, Lilydale*.

**lilydalensis** Gill, 1949, **Trimerus**
Gill 1949a: 69, pl. 8, figs 4, 5, pl. 9, fig. 7, text-fig. 1F.
Early Devonian, Lochkovian, Humevale Formation, Lilydale*.

**lindneri** Jell, 1985, **Protopliomerops**
Jell 1985: 79, pl. 30, fig. 2, pl. 32, figs 7-10, pl. 33, figs 1-4, text-fig. 2.
Early Devonian, Tremadoc, Digger Island Formation, Waratah Bay*.

**logimus** Jell, 1985, **Brachyhipposiderus**
Jell 1985: 71, pl. 26, figs 1-8.
Early Ordovician, Tremadoc, Digger Island Formation, Waratah Bay*.

**longisulcata** Shergold, 1968, **Acaste**
Shergold 1968: 20, pl. 4, figs 7, 8, pl. 5, figs 1-12 [pl. 4 figs 7, 8 (holotype) belongs to Phacopidae, remainder to unnamed acastid species; see Holloway & Neil 1982: 150].
Early Devonian, Humevale Formation, Chirnside Park* and Lilydale.

cf. **manitouensis** Walcott, 1925, **Leiostegium**
Jell 1985: 64, pl. 22, figs 11, 12.
Early Ordovician, Tremadoc, Digger Island Formation, Waratah Bay.

**mansfieldensis** Etheridge & Mitchell, 1896, **Phacops**
Etheridge & Mitchell 1896: 501, pl. 39, fig. 12.
Early Devonian, Zlichovian, Norton Gully Sandstone, Mansfield district*.

**meridianus** Etheridge & Mitchell, 1896, **Hausmannia**
Etheridge & Mitchell 1896: 504, pl. 40, fig. 1 (see Dalmanites wandongensis).
Dalmanites meridianus. - Gill 1938: 171, figs 3, 4.
Early Devonian, Pragian, Humevale Formation, Woori Yallock.

**minima** Chapman, 1911, **Ptychoparia**
Chapman 1911: 318, pl. 58, figs 1, 6?, pl. 59, fig. 22.
Thielaspis minima (nomen nudum). - Thomas & Singleton 1957: 158.
Middle-Late Cambrian, Dolodrook Limestone, Dolodrook River*.

**neglecta** Öpik, 1949, **Centropleura**
Öpik 1949: 57, pl. 1, figs 1, 2.
Middle Cambrian, Knowsley East Formation, Heathcote district*.

**oxina** Holloway & Neil, 1982, **Cheirurus (Crotalocephalina)**
Holloway & Neil, 1982: 140, fig. 3M-U.
Crotalocephalus oxinus (sic). - Chatterton & Wright 1986: 289.
Early Devonian, Lochkovian, Mount Ida Formation, Unit 3, Heathcote district*.

**parkerae** Jell, 1985, **Onychopyge**
Jell 1985: 65, pl. 23, figs 1-16, pl. 24, figs 1-4.
Early Ordovician, Tremadoc, Digger Island Formation, Waratah Bay*.

**parvulus jikaensis** Chapman, 1912, **Ampyx**
Chapman 1912: 294, pl. 61, figs 1, 2.
Raphiophorous jikaensis. - Thomas 1978: 53.
Late Silurian, Ludlow, Melbourne Formation, Moonee Ponds Creek, Flemington*.

**rugulata** Chapman, 1917, **Saratogia?**
Chapman 1917: 99, pl. 7, fig. 24.
Middle Cambrian, Knowsley East Formation, Heathcote district*.

**serratus** Foerste, 1888, **Phacops**
Chapman 1915: 169, pl. 15, fig. 16.
Phacops cf. serratus. - Talent 1965: 50, pl. 26, figs 6-8.
Ananaspis serrata. - Holloway & Neil, 1982: 146, fig. 5A-P.
Early Devonian, Humevale Formation, Yarra River (Chapman 1915); Early Devonian, Lochkovian, Mount Ida Formation, Unit 3, Heathcote district (Talent 1965, Holloway & Neil 1982).

RECORDS OF VICTORIAN TRILOBITES (Cont'd)

**silverdalensis** Etheridge & Mitchell, 1917, **Cheirurus (Crotalocephalus)**
Philip 1962: 228, pl. 34, fig. 1, pl. 35, figs 1, 2, 14, 15.
Early Devonian, Lochkovian, Boola Formation, Tyers area, Gippsland.

cf. **silverdalensis** Etheridge & Mitchell, 1916, **Encrinurus**
Strusz 1980: 36, pl. 5, fig. 17.
Late Silurian, Ludlow, Gibbo River Siltstone, Wombat Creek, NE Gippsland.

**simpliciculus** Talent, 1965, **Encrinurus**
see Encrinurus (Cromus) spryi Chapman, 1912.

**singletoni** Jell, 1985, **Australoharpes**
Jell 1985: 73, pl. 27, figs 1, 3-8.
Early Ordovician, Tremadoc, Digger Island Formation, Waratah Bay*.

**spryi** Chapman, 1912, **Encrinurus (Cromus)**
Chapman 1912: 297, pl. 62, fig. 1.
Encrinurus simpliciculus Talent 1965: 48, pl. 24, figs 1-6, pl. 25, figs 1, 3, 7.
Cromus spryi. - Strusz 1980: 11, pl. 1, figs 1-3.
Late Silurian, Ludlow; Melbourne Formation, South Yarra*; Dargile Formation, Heathcote district (Talent 1965).

**spryi** Gregory, 1901, **Cyphaspis**
Gregory 1901: 179, pl. 22, figs 1, 2.
Late Silurian, Ludlow, Melbourne Formation, South Yarra*.

**sternbergi** (Boeck, 1827), **Cheirurus**
Chapman 1915: 167, pl. 15, figs 12, 13, pl. 16, fig. 22.
Early Devonian, Humevale Formation, Wandin Yallock and Chirnside Park.

**sweeti** Etheridge & Mitchell, 1896, **Phacops**
Etheridge & Mitchell 1896: 497, pl. 38, fig. 9, pl. 39, figs 1, 2, pl. 40, fig. 10.
Early Devonian, Zlichovian, Norton Gully Sandstone, Mansfield district*.

**thielei** Chapman, 1911, **Ptychoparia**
Chapman 1911: 316, pl. 58, figs 2, 3, 5, 7, 10.
Thielaspis thielei (nomen nudum). - Thomas & Singleton, 1957: 158.
Middle-Late Cambrian, Dolodrook Limestone, Dolodrook River*.

**thomastus** Öpik, 1953, **Thomastus**
Öpik 1953: 23, pl. 8, figs 61-71, text-fig 8. - Talent 1965: 47.
Early Silurian, Late Llandovery, Wapentake Formation, Heathcote district*.

**tuberus** Jell, 1985, **Natmus**
Jell 1985: 63, pl. 20, figs 9-12.
Early Ordovician, Tremadoc, Digger Island Formation, Waratah Bay*.

**typhlagogus** Öpik, 1953, **Phacops**
Öpik 1953: 26, pl. 10, figs 81-84.
Ananaspis typhlagogus. - Campbell 1967: 32.
Early Silurian, Late Llandovery, Wapentake Formation, Heathcote district*

**urbis** Strusz, 1980, **Coronocephalus**
Strusz 1980: 13, pl. 1, fig. 13.
Late Silurian, Ludlow, Gibbo River Siltstone, Wombat Creek, NE Gippsland.

**vicarius** Öpik, 1953, **Thomastus**
Öpik 1953: 24, pl. 9, figs 75-79.
Talent 1965: 48.
Early Silurian, Late Llandovery. Wapentake Formation, Heathcote district*.

**victus** Jell, 1985, **Natmus**
Jell 1985: 61, pl. 21, figs 1-15.
Early Ordovician, Tremadoc, Digger Island Formation, Waratah Bay*.

**vomer** Chapman, 1912, **Homalonotus**
Chapman 1912: 298, pl. 62, figs 2, 3, pl. 63, figs 1, 2.
Trimerus vomer. Gill 1949a: 65, text-fig. 1B, C.
Late Silurian, Ludlow, Kilmore Siltstone, Wandong*.

**wandongensis** Gill, 1948, **Dalmanites**
Phacops (Odontochile) caudatus (Brünnich, 1781). - McCoy 1876: 13, pl. 22, figs 1-7, pl. 23, figs 7-10.
Hausmannia meridianus. - Etheridge & Mitchell 1896: 504 (partim), pl. 40, fig. 1 (not pl. 38, figs 1-8).
Dalmanites wandongensis. Gill 1948: 18, pl. 1, figs 1-4.
Silurian, Ludlow, Kilmore Siltstone, Wandong*.

**yarraensis** Chapman, 1912, **Ampyx**
Chapman 1912: 295, pl. 61, fig. 3.
Raphiophorus yarraensis. Thomas 1978: 53.
Late Silurian, Ludlow, Melbourne Formation, South Yarra*.

**yassensis** Etheridge & Mitchell, 1894, **Cyphaspis**
Chapman 1915: 164, pl. 14, fig. 7, pl. 16, figs 20, 21.
Late Silurian, Ludlow, Gibbo River Siltstone, Wombat Creek, NE Gippsland.

NOTE: The second part of this article "UNNAMED SPECIES, UNNAMED GENERA & REFERENCES", will be published in Bulletin No. 35.

COVER PHOTOGRAPH

Cranidium x 4 approx. and pygidium x 9.5 approx. of a new cheirurid trilobite from the Early Devonian Toongabbie limestone of Victoria. Formal description of the genus by David Holloway is in press.

# BOOKS AND BOOK REVIEWS

GRAPTOLITES : WRITING IN THE ROCKS (Fossils Illustrated, volume 1) edited by Douglas Palmer & Barrie Rickards. The Boydell Press, Woodbridge, Suffolk, UK., 1991: 182 pages, 138 plates.
Available from D.A. Books and Journals, 648 Whitehorse Road, Mitcham, Victoria 3132, Australia. Price AUST$90.00 plus AUST$4.25 postage and packing for prepaid orders within Australia (see enclosed Order Form).

Not being a graptolite worker, it was with some trepidation that I accepted the task of reviewing this book, albeit purely for the recipients of this bulletin. Until the advance copy arrived from the UK, I was not quite sure what to expect. The first thing that came to mind was - will I be able to understand what they, the authors, are talking about? Admittedly I have collected graptolites in Australia and have a number of text books on invertebrate palaeontology with sections on these extinct Palaeozoic hemicordates; so at least I know what graptolites look like.

Although I had heard about the excellent reviews in the overseas scientific press I deliberately did not search them out, lest I be influenced by professional opinions.

Thankfully, this is not just another text book or treatise, but an agreeably refreshing and eminently readable book (even I might add, in bed after midnight!) that could easily have been titled "All you ever wanted to know about graptolites and were afraid to ask!" for indeed that is probably the most accurate description of its contents. Each chapter answers specific questions about these extinct animals from What are they?, Where and when did they live?, through to How are they classified? and What use are they anyway?.

In addition to learning the answers to these and other questions in delightfully concise and generally easy to understand chapters, the book contains eight appendices which supplement the general text including a very comprehensive glossary of terms, references for further reading, arranged chapter by chapter and what is quite rare in books of this type, exact locality details and the names of graptolite workers (in the UK) "who have agreed to act as counsellors for any bona fide enquiries about graptolites that arise from reading this book" (Appendix 7).

While locality and stratigraphic references relate predominantly to United Kingdom graptolite deposits, occurrences from many other countries, in particular Australia and Canada, are mentioned in the text. Indeed out of the 138 photographic illustrations, Australian graptolites are used in 21 instances, exceeded in representation only by Canada (27) and the UK (22).

All told specimens from 12 different countries (counting the UK as one) are used to illustrate this book, something which emphasizes the wide distribution of these creatures around the world. In fact we are told in chapter 4 that graptolites have been found on every continent except Antarctica.

One of the many refreshing items is the open and unbiased discussion of the differences of opinion that exist between groups of graptolite workers on certain aspects of their research. One short chapter deals solely with this subject including the Baragwanathia flora dating debate (Late Silurian-Early Devonian plant/graptolite associations in Victoria).

Having literally read the book from cover to cover, the only personal criticism

is the lack of diagrams to help explain the construction of graptolites contained in chapter 3. As a virtual ignoramous in regards to this aspect of graptoloids and dendroids, I found the various parts of their anatomy, although very clearly defined in the glossary and well cross referenced to the excellent photographic illustrations, sometimes hard to envisage when reading these five pages. Like the separation of plates (figures) and figure explanations at the back of the book, this is only a minor inconvenience, as such diagrams can be found in major textbooks on invertebrates as well as the relevant volume in the "Treatise".

Bearing in mind that Australia has one of the most complete Ordovician/Silurian graptolite sequences in the world, this book is surely a must for any professional or amateur interested in this absorbing subject. Even though I am an "echinoid" person, I had barely finished reading the book before I found myself shoving a long since collected graptolite bearing rock from Bendigo under the microscope, reinforced with considerably more knowledge than I had ever had before on what I should be looking for. By the way, did you know that there are over 1,000 recorded graptolite localities in the Bendigo region of Victoria?.

To sum up the authors', and perhaps more particularly, the editors' approach to this subject and consequently the contents of the book, a quote from the Introduction, "There is in graptolite research, considerable scope for enthusiastic amateur workers, at the very least by making important collections of good material"; and in a somewhat similar vein in Appendix 5, "most palaeontologists want to encourage the amateur and subscribe to the more literal and old fashioned meaning of 'amateur' rather than its modern slightly derogatory connotation".

Review by Frank Holmes, Heathmont, Victoria, May 1991.

VERTEBRATE PALAEONTOLOGY OF AUSTRALASIA edited by P. Vickers-Rich, J. M. Monaghan, R. F. Baird & T. H. Rich, 1991: 1440 pages. Available from Dr. P. Vickers-Rich, Department of Earth Sciences, Monash University, Wellington Road, Clayton, Victoria, 3168. Price AUST$59.50 plus AUST$10.00 packing and postage within Australia, or AUST$22.00 for packing and postage overseas.
NOTE: ALL CHEQUES TO BE MADE PAYABLE TO MONASH UNIVERSITY.

This book on Australasian vertebrate palaeontology presents a state-of-the-art resume of the different disciplines comprising this rapidly growing scientific endeavour in Australia, New Zealand, the southwest Pacific and Antarctica.

It is the end result of 8 years of work that has not only updated and refined the preliminary volume, The Fossil Vertebrate Record of Australasia, but added new chapters on vertebrate microfossils; fossil turtles; fossil eggs; the Quaternary avifauna of Australia; the Quaternary megafauna of New Zealand; the vertebrate fossil faunas of the islands of Australasia, including the southwestern Pacific; and the fossil vertebrates of New Caledonia. In addition the illustrations have been increased in both quality and quantity.

Vertebrate Palaeontology of Australasia is divided into three major sections: Background to the Fossil Record, Techniques and Analysis of Fossils, and Vertebrate Fossil Record of Australasia. The first section presents the history of vertebrate palaeontology on the Australian continent and in New Guinea; an overview of the geological history and palaeoenvironmental setting during the history of vertebrates, with emphasis on Australia; and a final chapter on the literature of vertebrate palaeontology for the Australasian area.

Cont...

The second section outlines the different kinds of techniques - collecting, preparation, and analytic - that have been applied to Australasian fossil vertebrates. Many of the chapters in this section are new, not being present in The Fossil Vertebrate Record of Australasia, such as that on preparation and collection techniques and another on biomolecular analyses as applied to vertebrate fossil remains in Australasia. New, too, is a chapter on the interpretation of the diet of a recently extinct bandicoot, Chaeropus, as well as a chapter on taphonomy of vertebrate bone accumulations in caves.

The third section deals specifically with the vertebrate fossils recovered from Australasia. Much of the added length of the present book, compared with its predecessor, is a reflection of the enormous growth in the information available on this subject since 1982.

It is hoped that the book will find use both as a standard reference work for the Australasian area and as a textbook/sourcebook for the beginning students or readers with an interest in palaeontology who have special interest in this most intriguing biogeographic area of the Earth. Despite its length and technical nature it is a very readable book and technical terms are explained so that the uninitiated can approach it without fear!

Based on information from the Publisher.

INTRODUCING VICTORIAN GEOLOGY edited by G. W. Cochrane, G. W., Quick and D. Spencer-Jones. Geological Society of Australia (Victorian Division), Melbourne, 1991: xii + 304 pages. Available from The Publications Officer, GSA [Vic.Div.], G.P.O., 2355V, Melbourne, Victoria, 3001. Price AUST$25.00 plus handling and postage of AUST$5.00 within Australia (overseas orders at cost).

Although this book has been written to meet the long felt need for an authoritative text book on geology for VCE Year 11 and 12 secondary school teachers and students, it will be equally as valuable for general readers, bushwalkers, fossickers and people attending Adult Education classes and first year college courses.

It is, as the title indicates, an introductory book on Earth Science and the Environment based on the geology of Victoria and is a companion volume to the Victorian Geology Excursion Guide published by the Australian Academy of Science in conjunction with the GSA (Victorian Division) in 1988.

Introducing Victorian Geology is an A4 size soft cover book containing chapters on basic concepts, soils, geomorphology, geological history of Victoria (with numerous references to fossils), economic geology, water and finally engineering and environmental geology. Written by a panel of experts it is easily readable and very well illustrated, containing over 400 figures and plates.

It should be stressed that this is a completely new work and not a scaled down version of the far more technical and detailed Geology of Victoria, also published in 1988.

No Victorian interested in Earth Science, or indeed anyone making an extended visit to this State, should be without a copy. At AUST$25.00 plus handling and postage it is a bargain not to be missed.

Based on information from the Publisher.